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MEASURING THE IMPACT OF ADVERTISING ON ARMY RECRUITING: DATA ENVELOPMENT ANALYSIS AND ADVERTISING EFFECTIVENESS

BY

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The objective of this study was to initiate evaluation of the effectiveness of Army advertising. The study employed Data Envelopment Analysis (DEA) and goal programming methodologies to (1) enhance the existing DEA-based mission model, (2) initiate analysis of further advertising variables, and (3) thereby obtain a basis for a future media-allocation model.

The objectives were attained and software was provided and implemented on USAREC machines and successfully run by USAREC personnel in at least four demonstrations as well as in current in-house utilizations.

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Table of Contents

I. Introduction 1

II. Purpose of the Research 2

III. Data Envelopment Analysis Background 3

IV. Data and Development 8

V. Advertising Effectiveness Model and DEA Representation 12

VI. The Robustly Efficient Comparison Set 17

VII. Goal Programming Extensions 18

VIII. System Overview 20

IX. Analysis 24

X. Results 31

XI. Conclusions 31

XII. Directions for Future Research 32

XIII. References 34

XIV. Appendix

A: Initial USAREC Data Request 35

B: Data Summaries 37

C: System User Manual 60

The references listed in Section XIII are referred to by a number in a [0].

List of Figures

1. Efficiency example.... 8

2. System overview 21

List of Tables

1. Initial input/output selection....13
2. Revised input/output selection....15
3. DEA executive summary....25
4. Robustly efficient comparison set for Q1 of FY90....26
5. Elasticities for Q1 of FY90....30

I. Introduction

Previous Research

The Center for Cybernetic Studies (CCS) has provided over ten years of successful research for the United States Army Recruiting Command (USAREC), using and developing primarily the powerful Data Envelopment Analysis (DEA) methodology. Beginning in 1980, only two years after the initial international presentation of DEA, CCS and USAREC embarked on the first exploratory effort to determine the feasibility of utilizing DEA to aid in the management of recruiting activities. During this early effort, concepts of "effectiveness" were contrasted with concepts of "efficiency," revealing for the first time that battalions could in fact be operating efficiently without achieving stated mission goals.

In later years, the Center was involved in a major study to develop the Army's position on the joint versus service-specific advertising mix policy issue. Sparked by the Department of Defense (DOD) Joint Advertising Mix Experiment (JAME), the Center and the USAREC staff utilized DEA methods to devise means to quantify the effects of shifting advertising resources from service budgets to joint advertising efforts. The Center's results disagreed with those of the DOD contractor, the Wharton Center for Applied Research (WCAR). Additionally, a Center critique of the contractor's findings, in conjunction with the conclusions from the DEA research, resulted in preventing over $50 million in cuts in the Army's advertising budget. Also, mainly due to the effect of the Center's efforts, the RAND Corporation was tasked to reassess the contractor's findings in the Joint Advertising Mix Experiment. Additional corroborative findings by the Center, again using DEA and more current data, strengthened the earlier findings. RAND results agreed with Center findings, both concluding that no policy decisions about service advertising should be made based on the DOD contractor's work.

In 1988, the Center developed innovative mission models that provided "negotiating slack" for the commanding general of USAREC in adjusting each battalion's quarterly mission. These DEA-based models provided estimates, with only one pass of the USAREC data base, that were

highly consistent with estimates prepared by the USAREC staff utilizing expert judgement and much more data and computation.

Throughout this continued cooperation, parallel development of both the technology utilized by the USAREC staff and theory have resulted in development of a joint team concept for USAREC research. This concept has led to the credible establishment of the USAREC staff and CCS as leaders in the field of personnel research making new developments over state of the art Operations Research methods. New data have been developed that aid in improvements to the daily operations of USAREC. Both Center personnel as well as USAREC staff have been trained in the nuances of the complicated system found in recruiting for today's Army. Application driven theory has been developed that not only appears in the world's finest academic journals and presentations, but also aids in the management of actual recruiting operations.

The current effort continued the team concept into the development of sound principles to measure the impact of Army advertising.

II. Purpose of Research

The urgency for a methodology to answer the difficult questions now posed by the requirement for reductions in defense spending is self evident. The measure of the impact of advertising in marketing in general has been very elusive as such impact is not a purely causal relationship of known physical laws. As mentioned above, attempts by others to model the impact of advertising as a static, causal relationship has resulted in erroneous conclusions that may have extremely deleterious effects in this budget reducing environment.

The purpose of the current research effort was to initiate sound, analytical means to evaluate the impact and effectiveness of advertising resources on the recruitment of high quality prospective soldiers for the U.S. Army. Necessary informatics and software were to be developed so that the results of the research could be readily implemented for further use on a personal computer.

This effort concentrated on the graduate-senior, male, test score category I-III A (as measured by the Armed Service Vocational Aptitude Battery of Tests, or ASVAB), called "GSMA" throughout the remainder of this report. The GSMA is traditionally the most difficult to recruit and the most demand constrained of the various possible categories of potential recruits.

The research methodology relies on the application of the powerful DEA methodology and has been proven to be successful in the quantitative realization of other related aspects of Army recruiting as well as new extensions and developments. In part, the research focuses on the high resolution capabilities of DEA for providing managerially useful information *at the battalion level.* Additional new research developments building from past successful advertising research focus on proper aggregation of these high resolution results through new goal programming enhancements to the DEA so that reasonable "quick and dirty" answers to aggregate questions can be provided. We call the whole system the ADEFF system.

This report will first outline basic and associated concepts and detail the data development. Then new developments to the DEA methodology involving extensions by means of goal programming will be presented, followed by a brief description of the software informatics system that operationalizes the current aggregate part of the new theory. Analysis of first quarter FY90 data will then be presented. Finally, results, conclusions and recommended future research will be provided. A user manual is also included in this report.

III. Data Envelopment Analysis Background

Data Envelopment Analysis (DEA) is a new statistical methodology that provides a means to evaluate the "efficiency" of an organization in converting resources into goods, products and /or services. The methodology was originally developed by A. Charnes and W.W. Cooper, along with colleagues and students. The original work involved determining better means to evaluate public programs, where market and pricing factors do not really exist. The methodology utilizes observed data from an implicit "production" process to develop the efficiencies.

The following definitions are needed in understanding DEA:

Outputs: The desired outcome goods or services that an organization produces.

Inputs: Those resources that an organization utilizes in producing outputs.

Decision Making Units (DMU): The organizational units where inputs are converted into outputs.

The description that follows comes from References [1], [3] and [5] of Section XIII. DEA is based on the engineering-scientific definition of efficiency, where the ratio of a single output to a single input (in the same measure, e.g., energy) provides the efficiency measure. Charnes and Cooper generalized this single input/output case to one that encompasses multiple inputs and multiple outputs [3]. By, for example, utilizing "virtual multipliers" and then summing the multiple inputs and outputs [3], single "virtual" inputs and "virtual" outputs could be obtained for each organization unit. More specifically, determination of the efficiency of a DMU can be expressed as follows:

$$\max\ \eta^T y_o/\xi^T x_o \text{ with } \eta^T y_j/\xi^T x_j \le 1, \quad \eta, \xi \ge 0, \qquad j = 1,\ldots,n \tag{1}$$

$$\text{where } y_j^T = (y_{1j},\ldots y_{sj}), \quad x_j^T = (x_{1j},\ldots x_{mj}),$$

where x_j= is a vector of the actual observed input values for the jth DMU; y_j is a vector of the actual observed output values for the jth DMU; "0" indicates the DMU currently under investigation; and η and ε represent the vectors of "virtual multipliers." It should be noted that these multipliers are exactly what will be "solved for" in this program. This is the original "CCR ratio" form of DEA.

This formulation, with the multiple input/output efficiency measure reduced back to a single virtual measure that has to be solved for each DMU, involves nonlinear, nonconvex problems that have linear fractional constraints. Thus, they present an extensive computational problem.

To eliminate false technical efficiency determinations (recognized by Farrell [7]) stemming from optimal entries of η or ξ, being zero, the above form was immediately replaced by the non-Archimedean CCR form:

$$\max\ \eta^T y_o/\xi^T x_o \text{ with } \eta^T y_j/\xi^T x_j \leq 1,\ \eta^T/\xi^T x_o \geq \varepsilon e^T \tag{2}$$

$$\xi^T/\xi^T x_o \geq \varepsilon\, e^T, \qquad j = 1,\ldots,n$$

where ε is a non-Archimedean infinitesimal and e^T are vectors of ones.

Using the Charnes-Cooper transformation: $\mu^T = t\,\eta^T,\ u^T = t\,\xi^T,\ t = \left(\xi^T x_o\right)^{-1}$ (3)

reduces equation (2) to linear programming form.

The equivalent dual linear programs are:

CCR $\quad \max\ \mu^T y_o$ with $\upsilon^T x_o = 1,\ \mu^T Y - \upsilon^T X \leq 0, \mu^T \geq \varepsilon e^T, \upsilon^T \geq \varepsilon e^T$ (4.1)

DEA $\quad \min\ \theta - \varepsilon e^T s^+ - \varepsilon e^T s^-$ with $Y\lambda - s^+ = y_o, \theta x_o - X\lambda - s^- = 0$ (4.2)

and $\lambda, s^+, s^- \geq 0$ where $Y = [y_1,\ldots,y_n], X = [x_1,\ldots,x_n]$

This problem is equivalent to the original efficiency ratio form and, through standard linear programming (LP) manipulation using dual to primal and other relationships, one can solve it on the "DEA side" using standard LP solution techniques. By determining the solution to the linear programs of equation (5), we get the "best possible" values of μ and υ for an efficiency (or "relative efficiency") rating, based on a comparison of each DMU to the "best" production of any and all other DMUs in the data set. Moreover, solution of the DEA side also immediately gives individual shortfalls in outputs and surpluses (wasteage) in inputs relative to efficient production. No *a priori* specification of the virtual multipliers is required.

Charnes and Cooper showed that this efficiency measure (with sums of products by virtual multipliers) was equivalent to one that the great quantitative economist Michael Farrell developed in

1957 [7]. Other economists and mathematicians, such as Frisch, Debreu and Shepard, had also worked on so-called "production theory," mostly in abstract theoretical forms and "production possibility" sets. Farrell's work prescribed means by which one could compare actual observations on the efficiency of one organization to others, but in a nonlinear, computationally nonpractical form [7]. Charnes and Cooper's work related the above formulation and solutions back to Farrell's work, which could now be accomplished practically because the linear programming problems permitted easy automatic comparison of the production capabilities of one DMU with all the others. If the DMU under investigation is inefficient, then the theory allows the "projection" of this inefficient DMU up to an associated "facet" of efficient DMUs. As hinted above, the distances traversed in this projection offer managerial information in the form of possible waste or shortfalls in the particular dimensions of inputs or outputs.

Other useful forms of DEA have also been developed. Charnes et al [5] present a most useful DEA model that is called the "additive" model:

$$\min \; -e^T s^+ - e^T s^- \text{ with } Y\lambda - s^+ = y_o, \qquad -X\lambda - s^- = x_o \tag{5}$$

$$e^T \lambda = 1 \text{ and } \lambda, s^+, s^- \geq 0$$

Interestingly, by taking logs of the virtual input-output vectors in the important multiplicative DEA model, it reduces to this additive form.

To ensure that the efficiency determined in the additive model is independent of the units of measurement for the inputs and outputs, the s^+ and s^- in equation (5) can be replaced by $\tilde{s}^+$, $\tilde{s}^-$ with $\tilde{s}_r^+ = s_r^+/y_{r\,o}$ and $\tilde{s}_o^- = s_o^-/x_{i\,o}$, $r = 1,\ldots s$, $i = 1,\ldots m$ This also improves numerical stability in the calculations.

To allow for the important possibilities of thresholds on possible inputs and ceilings on possible outputs, the "extended additive" model (see Charnes et al [5]) puts individual bounds on the DEA side "slacks" which do not require additional rows of constraints in usual LP software.

Conceptually, DEA "is" a dynamic model that operates at the DMU level and "views" the production process under investigation as a system of multiple inputs and outputs. Of course, development of effective informatics and software to start from the data, solve the whole set of linear programs, extract solution results and present conclusions was (and is for new models) a formidable task that has been done by the CCS for general usage and more specifically for Army problems.

But, back to basics, no *a priori* formulas are required or desired. All that is necessary is the determination of the relevant organizational level of analysis needed (i.e., the DMU specification), what relevant inputs and outputs are to be considered, and whether or not increase in an input will tend to increase or decrease outputs. The only other assumptions required are (1) that each DMU uses some non-zero, non-negative amount of each input to produce a non-zero, non-negative amount of output and (2) that the measure of efficiency is some proper form of a ratio of outputs to inputs. Actual managerial data for inputs and outputs are utilized in the analysis that maximizes the efficiency evaluation for each DMU. A simple graphical representation of this efficiency evaluation is seen in figure 1.

In this simple example, the concept of efficiency is explained. For a single input and a single output, DMU 2 is relatively more efficient than DMU 1, because, at the same input level, more output is produced. Similarly, DMU 3 is relatively more efficient than DMU 4 because the same level of output is produced with less input. The vectors depicted in figure 1 represent the direction one must "travel" from an inefficient DMU to attain efficiency. As stated, Charnes and Cooper extended all this to multiple inputs and outputs. By maximizing the ratio of combined ("virtual") outputs to combined inputs for each and every DMU individually, in the presence of all DMUs under investigation, one can determine the bases of an empirical efficiency frontier that can be used to provide relevant managerial information.

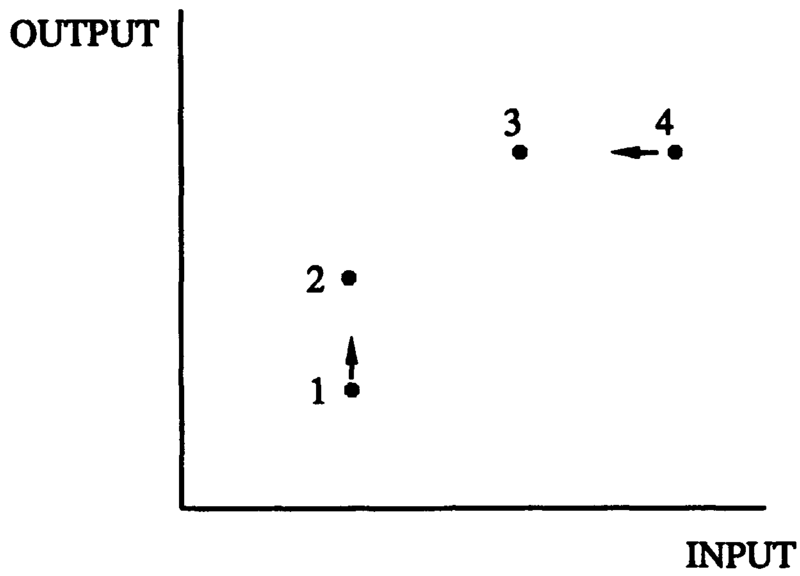

Figure 1. Efficiency example

IV. Data and Development

General

Any research effort involves answering such questions as what inputs and data are adequate to represent the "real world" in a suitable mathematical formulation of that reality. Theory and data for earlier attempts at measuring advertising effectiveness were limited to national advertising. No local theory extensions exist, and no local data have been available. Thus, a proper development of the inputs and outputs needed for the DEA methodology, which builds from the battalion level, required detailed collaboration between the CCS researchers, the USAREC staff, and the Army's advertising agency, Young and Rubicam.

Initial data requests were developed from near-exhaustive listings of important possible inputs available to the recruiter. Following an early research requirement that the newly developed modeling system be compatible with earlier mission adjustment models, the Enlisted Projection Model (EPM) data base, maintained by USAREC internally, was designated as the "base" from which the advertising effectiveness data base would be developed. An absolute minimum of four

quarters of data was requested, by battalion for each quarter. Additionally, the new data base needed to contain the advertising resources that had not been updated or collected in the EPM data base since 1984. Finally, the data (and the subsequent modeling effort) needed to be portable and implementable on a personal computer.

Detailed discussion with advertising agency officials and the USAREC staff revealed that information on national advertising expenditures was not being maintained in a form that could be readily utilized for this and other research, as well as for managerial use. Hence, the means to gather appropriate measures of advertising activity had to be developed jointly by the CCS research team, the USAREC staff and advertising agency experts. The original data items that were to be included in this newly developed data base are listed in Appendix A.

Several different levels of possible analysis (and data collection) were observed, from individual recruiters, to stations, to companies, to battalions, to brigades and finally, the entire recruiting command. Based on previous CCS research and agreement among the team assembled that recruits are actually contracted at the battalion level, the battalion was selected as the DMU for DEA representation.

Research on national advertising data in general revealed that the level of observation closest to the battalion level needed for this analysis is the Area of Dominant Influence (ADI), as developed by the Arbitron Corporation. This geographic measure is developed from county-level data and is used on a daily basis (along with others) by advertising agencies in media planning and purchases.

Initial attempts were made to secure the advertising data from the Defense Manpower Data Center (DMDC), based on earlier work in response to the Joint Advertising Mix Experiment. The DMDC had been required by the DOD to collect such data for not only the Joint Advertising Mix Experiment but also to foster future research. Advertising data in the form of impressions and gross rating points (GRPs) were found to be available at the ADI and battalion level for FY84 for

only 73 of the 211 ADI currently measured. These 73 markets were those selected by the Wharton Center for Applied Research , contractor for the Joint Advertising Mix Experiment. As has been shown by Charnes et al [3], the so-called "balancing" of these experimental test cells was seriously flawed. Therefore, these data were deemed unusable for the current analysis.

Similar data were available for FY85, but the "post-buy analysis" used to convert actual purchase data to impressions and GRPs by market and battalion was performed by another contractor associated with the Joint Advertising Mix Experiment. Because their methodology was proprietary, it was not available to the CCS research group. Since the conversion methodology could not be scrutinized, evaluated, or replicated by the CCS research team for more timely analysis, these data, too, were deemed inappropriate for this research effort. More current data (FY85-FY89) had been collected by the DMDC for each of the services, but standards for the advertising data had been relaxed considerably at the request of the services after the conclusion of the Joint Advertising Mix Experiment. Only gross budgetary-type data at the command level existed, and these data were poorly documented. Once again, the CCS research team found the use of these data unwarranted.

New methods of data collection and analysis were created especially for this research effort and to fill the void that apparently had been left in the data collection effort by the DOD. Working closely with the Young and Rubicam staff and with the USAREC staff, the CCS research team developed a means to convert the national purchase data to GRPs and impressions by ADI. This automated conversion process is now performed on a quarterly basis by the Young and Rubicam staff and provided to the USAREC staff.

Crosswalk Development

In order to utilize the national advertising data collected at the ADI level in the DEA model which operates at the battalion (= DMU) level, algorithms were developed that first disaggregates the data to Zip Code level and then "reaggregates" to the battalion level based on the total Census

Bureau population proportion in a particular Zip Code area. This algorithm, or "crosswalk," carries with it the assumption that, on the average, each individual receives an equal amount of exposure to a particular medium (e.g., cable TV, network TV, radio, etc.). This is a reasonable assumption for the purposes of this exploratory development of new research methodologies. Details of the crosswalk algorithm, which was developed by the USAREC staff, are available from Chief, Advertising Research and Analysis Division, Headquarters, U.S. Army Recruiting Command, Fort Sheridan, IL 60037-5000.

Local Advertising Data

Local advertising data were available at the DMDC for FY84 through FY88. These data were collected in the form of dollar expenditures by battalion by month, as there currently exists no means to convert these data to impressions or GRPs. Documentation on production costs versus media time and space expenditures were lacking, however. The USAREC staff maintains local advertising expenditure data on its Local Media Payment System (LMPS) data base. In fact, local advertising data is reported to the DMDC from this data base. Local ad data could be readily procured internally from this source. Additionally, the USAREC advertising research staff could then "quality check" the actual items reported, thus more accurately capturing actual media time and space measurement.

Very detailed data on direct mail response was found at the DMDC, as each service reported this item from FY84 to FY88 according to a very specific data call. Again, to facilitate timely research, this item was collected directly from the Army subcontractor for quarters 2 through 4 of FY89. Although this medium is managed at the national level, direct mail has characteristics similar to local advertising. It can be targeted directly to specific regions or battalions with a much shorter planning horizon than can other national media. Like local advertising, direct mail is more controllable by internal USAREC management decision than are the highly visible and relatively more costly national media. Due to a time delay in requesting these data from the DMDC, USAREC opted to develop the four-quarter data set on direct mail internally.

Data Analysis

Preliminary data analysis was performed using several software packages and methodologies. Graphical data analysis was performed using MacSpin (copyrighted) software for the Macintosh computer. This graphic, exploratory data analysis technique allowed for rapid identification of obvious data errors, which were corrected through direct collaboration with USAREC staff members. Tabular descriptive data summaries are enclosed at Appendix B for reference. Direct mail data were available only for quarters 2, 3 and 4 of FY89.

Impact of Data Development on Research and Management

The necessary preliminary stages of data development were most important to this research effort and should not be thought of lightly. USAREC now has a data base and the associated system for updating and maintenance on line in a highly portable, PC implementation. Dialogue between the advertising agency and the USAREC staff has been fostered as a result of this effort. New methodologies that are well documented and replicable were developed to provide for management utilization of the data as well as for future research. Finally, valuable experience was gained by all members of the team that may lead to future improvements in recruiting operations, management and research.

V. Advertising Effectiveness Model (ADEFF) and DEA Representation

The purpose of this section is to describe the overall research progress, highlighting the results of new theoretical developments from other research efforts that were applied to USAREC problems. Then, in subsequent sections of this report, these application-driven theoretical enhancement results will be detailed in the context of the output from actual quarter 1 FY90 data.

Initial experimental DEA analysis began upon receipt of adequate data. As stated in §II, the research effort was limited to a single output (GSMA contracts), both for the importance associated with this output and for initial prototype development. Detailed collaboration

with the USAREC staff and reliance upon previously successful DEA application to the recruiting environment led to the consensus selection of the inputs and outputs shown in table 1.

Table 1. Initial input/output selection

Output:	GSMA Contracts
Inputs:	National Cable TV Impressions
	National Network TV Impressions
	National Magazine Impressions
	National Radio Impressions
	Local Advertising Expenditures
	Army Recruiters
	DOD Recruiters
	Unemployment
	Direct Mail (Number of pieces)

Again relying on past research, the "extended additive" DEA model was used for the initial experimental run. Results indicated that the impression measurement of the advertising input was not properly representing the "unduplicated awareness" (see [6]) that is present in a particular recruiting area. The additive representation, which had been highly successful in developing missioning ranges for the USAREC staff, was found to be improper for the measurement of this complex phenomenon, e.g., in approximating a new recursive advertising model developed outside this contract and which will be presented elsewhere in the scientific literature.

Also, since the direct mail data were available only for three quarters, and since the mailings are known to be very seasonal, this important input had to be discarded for this effort.

Extensive discussions were held with experts from Young and Rubicam to determine a "better" representation of the local awareness--one what would actually serve as a resource for the recruiter. The impression measurement had to be discarded as the proper measurement because the

effects of regional differences on the actual number of exposures gained in an area were confused by the use of the population "adjustment" that is employed in the calculation of impressions. Therefore, the gross rating point (GRP) was selected as a "better" measurement for the battalion "share" of the national media concerned. After software that produced the initial data base was altered, the desired GRP by battalion was finally delivered on 2 March 1990.

Concurrently, a new application of the multiplicative form of the DEA model was developed to approximate the new recursive relationship that generalizes an old one for brand marketing [6] and further extends to the various types of media as they impact on the recruiter's activity. The new multiplicative model is an approximation of the new recursive form, which builds on the original model [6], which has had, in various variants, a successful, 25-year track record of use with major advertising agencies throughout the United States. By taking the natural logarithm of each of the inputs and outputs and capitalizing on the use of dual linear programs, the DEA side of the multiplicative model can be reduced to the simpler form:

$$\begin{aligned} \max \quad & \delta e^T s^+ - \delta e^T s^- \\ & \hat{Y}\lambda - s^+ = \hat{y}_o \\ & \hat{x}\lambda + s^- = -\hat{x}_o \\ & e^T\lambda = 1 \\ & \lambda, s^+, s^- \geq 0 \end{aligned} \tag{6}$$

As may be noted, this model is now in the same mathematical form as the "additive" model. Thus, no new computer code is needed for its solution. Additionally, the new theory and approximation allow for inclusion of local advertising expenditures with national advertising GRPs.

This phase of the analysis and research arose from a new and additional preemptive effort that the USAREC staff requested of the CCS research team: concentrate on the most current quarter in the data and provide a quick, easy computer-implemented method for new and

immediately upcoming aggregative downsizing analyses that the USAREC staff would be involved in. In order to expedite developments to meet the deadline specified by USAREC in the most productive manner, the input/output selections were reduced to those shown in table 2.

Table 2. Revised input/output selection

Output:	GSMA Contracts
Inputs:	National Cable TV GRP
	National Network TV GRP
	National Magazine GRP
	National Radio GRP
	Local Advertising Expenditures
	Army Recruiters
	DOD Recruiters
	Unemployment

(It should be noted that in previous runs in the earlier, additive model formulation, the direct mail input did show possible importance in determining inefficiencies. Further research is required to determine a proper formulation of new models that include this input.)

Next, the stability of the data through seasonal change was examined. DEA runs using the new model were run with the inputs and output in table 2 for the following "windows":

Quarters 2-4 FY89 and Quarter 1 FY90

Quarters 2-3 FY89

Quarters 3-4 FY89

Quarter 4 FY89 and Quarter 1 FY90

Results indicated that the overall efficiency scores, the range of the efficiency scores, the number of battalions that were scored efficient, the battalions that were efficient, and the frequency of those

inputs that contributed the most to inefficiency remained stable regardless of the window under consideration.

Single quarter runs were then compared. Again, they indicated that the DEA results were stable over time and battalions. Since in this case interest is mainly in the changes in advertising inputs as the adjustment to efficiency is performed and since the lag effects of advertising seemed to be already contained therein, it was deemed reasonable to consider only one quarter at a time. This is in contrast to earlier research, where a minimum of four quarters was necessary to ensure that seasonal effects did not produce unreasonable or unobtainable mission estimates.

Cable and network TV GRPs differed drastically across regions. In collaboration with the USAREC staff, and also relying upon the results of past and current non-USAREC-supported research, it was possible to use the sum (logarithmic to continue the multiplicative formulation and to get at other aspects) of these variables to represent the total TV medium, in the DEA analysis. By assuming that the proportion of cable and network TV would be the same at efficiency, the total TV input might then be disaggregated for reporting purposes. The actual inputs that were selected are discussed in Section IX.

Past research on the "rate of change" in an output, given a change in an input, suggested trying to develop "Advertising Effectiveness Indicators," which are rankings via the dual variables of local (battalion) effects of each of the advertising inputs. These dual variables are produced via the DEA calculation, as mentioned in Section III. But disagreement on some such indicators with the experts from Young and Rubicam led us to drop them from the ADEFF package until detailed research can be accomplished at the battalion level to provide more adequate models that are also free of numerical inconsistencies caused by ill-conditioned matrices, etc. in actual computation.

Thus, presentation of some high-resolution data mentioned in Section III of this report has been limited to actual input and output values, values of each if efficient, efficiency score and the efficient comparison set for each battalion. Nevertheless, this phase of the research has produced

battalion-level results that can be used to suggest local managerial investigations and analyses of the relative impact of the different media and other environmental or managerial inputs.

Now let us consider macro-level analysis, for command-level decision support, first through the new development of the "robustly efficient comparison set" and then the new goal programming extensions.

VI. The Robustly Efficient Comparison Set

One of the most managerially useful by-products of the DEA methodology is the development of "facets," or efficient comparison sets. This concept was mentioned earlier in Section III of this report. Mathematically, facet members are obtained from the basic optimal solutions for each of the DEA computations. Managerially, facet members for a given DMU are those other DMUs (=battalions) that, with "similar" resources, are determined to be relatively efficient. Insights can be gained on attaining efficiency (hence, reducing waste in the use of resources or improving shortfalls in producing outputs) by observations and communications concerning actual operations in these efficient comparison units. Historically, important operational characteristics relative to management have been easily found via such units. For example, the commander of one of these efficient units may have recently been installed, thus revitalizing the operations of the unit and making it more efficient. Or, the battalion may be undertaking special marketing techniques, such as utilization of the local news media for coverage, that may not be measured via local advertising expenditure means. At any rate, the DEA again provides a tangible map for management to determine possible means for improvement of performance of inefficient units.

In a new theoretical development established by Charnes in other related work, the concept of the "robustly efficient comparison set" is introduced. By relying on the facet or comparison unit information provided for *each* DMU in the DEA envelopment map calculations, the frequency with which each DMU appears as a facet member is tallied. Those units that consistently (i.e., with the

highest frequency) appear as efficient are flagged as a "robustly efficient set." Efficient units can be rank ordered by frequency of appearance. Then, say for a beginning rule of thumb, the top $s + m$ of these DMUs, where m is the number of inputs and s is the number of outputs, may be designated as the "robustly efficient comparison set" (RECS).

This RECS, then, is the set of efficient comparison units that can be considered to consistently define the efficiency frontier. For this exploratory effort, a single RECS is developed, but future informatics and computational research should further refine this set into a series of *sectors* of the RECS, where each sector is in turn a RECS for those DMUs that are in the "neighborhood" of a portion of the piecewise linear efficiency frontier.

VII. Goal Programming Extensions

The RECS described above provides the basis for Charnes' new development in other non-USAREC work, used here to properly aggregate from the battalion-level DEA. This aggregation allows the decision maker to utilize the battalion-level information at the national or command level for policy- and resource allocation-type issues.

Stated mathematically, the following is a special form of the goal program formulation:

$$\begin{aligned} \text{Min} \quad & \sum_j \left(w_{j1}^+ S_j^+ + w_{j1}^- S_j^- \right) + \sum_i \left(w_{i2}^+ \delta_i^+ + w_{i2}^- \delta_i^- \right) \\ \text{s.t.} \quad & a + \sum_i C_i \hat{x}_i + S_j^- - S_j^+ = \hat{y}_j , \; j \in J \\ & C_i + \delta_i^- - \delta_i^+ = \overline{C}_i \qquad (7) \\ & a, \; \delta_i^-, \; \delta_i^+, \; S_j^+, \; S_j^-, \; C_i \geq 0 \\ & j = 1, \ldots, \text{number of DMUs in R.E. Comparison Set } J \\ & i = 1, .., \text{number of inputs} \end{aligned}$$

The $\overline{C}_i$ for each advertising input and the other sought coefficients are developed for this goal program via auxiliary information from past research and new approximations of the recursive model formulation. The x_i and y_i are the original input and output values for the RECS. The solution to the goal program optimization provides the $\dot{C}_i$, which are the elasticities, or rates of change, sought. Such an elasticity is the amount of relative change in the output (GSMA) with respect to a relative change, say, in an advertising input.

For use in sensitivity analysis and macro-level policy decision support, the efficient production function for the multiplicative model approximation is utilized as shown in the following "sensitivity formulae of analysis module."

Sensitivity Formulae of Analysis Module

Two points on the efficient frontier will satisfy:

$$y = A \, \Pi \, x_i \, C^i$$
$$\bar{y} = A \, \Pi \, \bar{x}_i \, C^i$$

where

$$\begin{array}{cc} y & x_i \\ \downarrow & \downarrow \\ \bar{y} & \bar{x}_i \end{array} \qquad (8)$$

But then we have

$$\frac{\bar{y}}{y} = \frac{A \, \Pi \, \overline{x_i} \, C_i}{A \, \Pi \, x_i \, C_i} = \Pi \left(\frac{\overline{x}_i}{x_i}\right)^{C_i}$$

where the y_i and x_i are the original values and the "bar" indicates the value of each after a proposed change in either input or output.

From equation (8) above, it is apparent that the proposed change is just a simple function of the original values of either input or output, related by the C_i values solved for in the goal program optimization. The extremely simple formula provided is very efficient computationally and can

provide immediate "quick and dirty," real-time answers to proposed changes in input or output values, such as may be encountered during reductions in resources or in "build downs" of desired output levels.

Thus, for the goal program RECS aggregation, a surprisingly simple functional relationship for sensitivity analysis has been developed. Of course, all this required an extensive effort to get the provided effective and user-friendly informatics and code development down to the PC level. The informatics developed in this effort will next be described, followed by the results of the analysis for first quarter FY90 data.

VIII. System Overview

General

The research process of this effort involved parallel (not sequential) development of new theory as well as informatics that operationalized the new theory. The results and realization of exploratory data analyses, DEA analyses and new developments specifically for this research effort may best be described via the system overview shown in figure 2.

The entire system allows for both the use of the ADEFF system developed for this research as well as the DEA-based Mission Adjustment Model (see [1]) provided to USAREC in November 1988. The entire DEA-based Mission Adjustment Model, as described in the mentioned final report, has been modified for use on a PC, to further facilitate its use by USAREC analysts.

The ADEFF system will now be described in detail.

Build Data Module

This module first reads the ADEFF data base, provided by USAREC and Young and Rubicam, and then selects the inputs and outputs described earlier that were developed jointly by

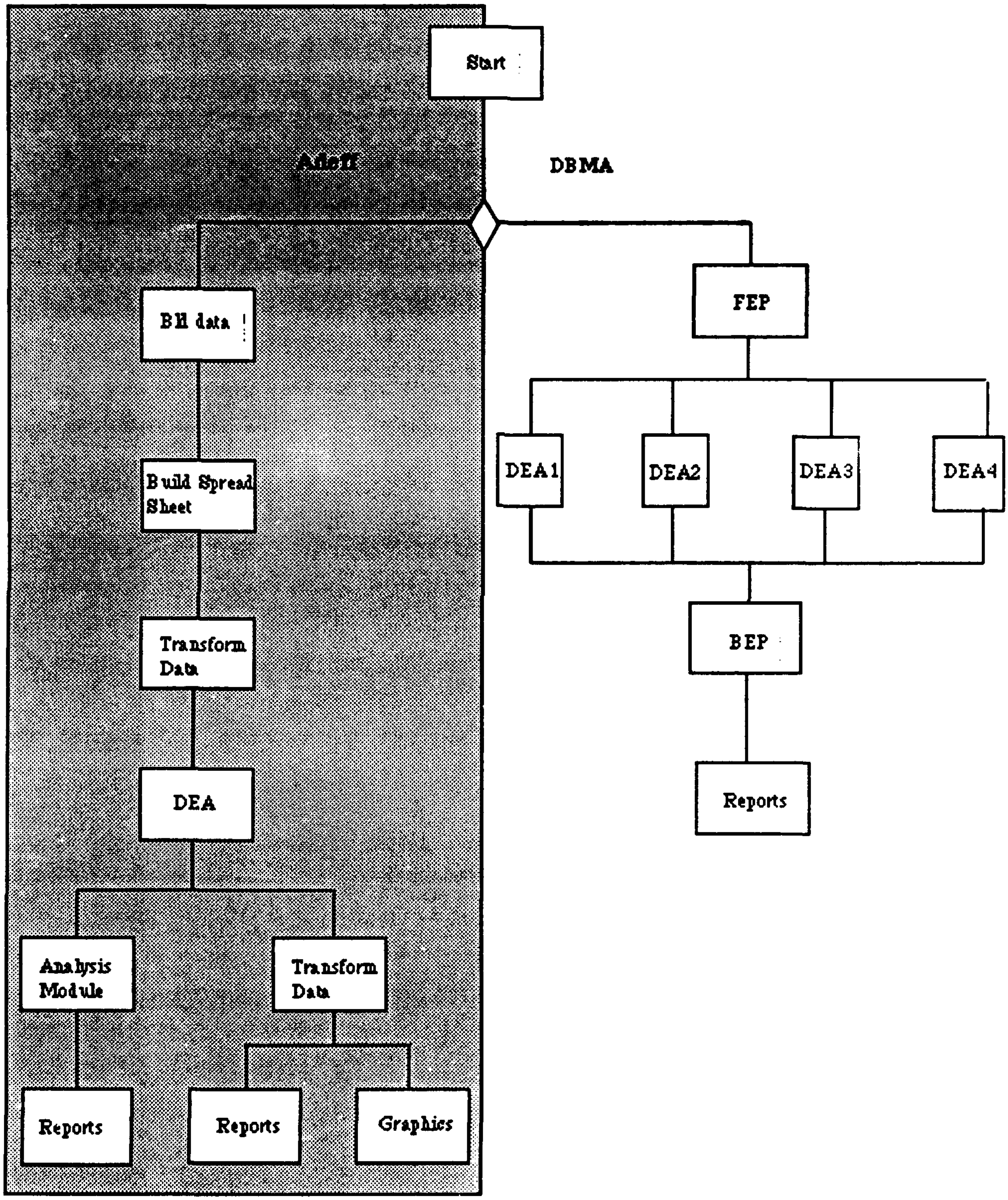

Figure 2. System overview

the research team. Specificall\ 'ailored for this particular application of the DEA methodology, the module then prepares the data for submission to the DEA and spreadsheet modules that follow.

Build Spreadsheet Module

This module works in conjunction with the preceding module to prepare the data for a user-friendly interface, relying on state-of-the-art information systems concepts. The program is developed in the powerful C programming language, affording powerful yet efficient data manipulation. The spreadsheet displays the inputs and outputs selected by a battalion for a high-resolution look at the data before DEA analysis and subsequent goal programming enhancements. In addition to providing menu choices to actually invoke the system of DEA-goal programming models, the spreadsheet offers a full range of editing and file functions, very similar to familiar spreadsheet systems.

Transform Data Module I

Necessary logarithmic transformations developed through the exploratory phase of the research to properly represent the synergistic effects of advertising are invoked in Transform Data Module I, as this DEA analysis module is called. These transformations also involve combining the cable and network TV inputs to properly dampen the sometimes exaggerated regional differences seen in the data. Other transformations are performed to enhance the actual use of the data in the computer codes developed for calculation and analysis. Newly developed DEA software provides the high-resolution, by-battalion analysis in this module.

Transform Data Module II

This module transforms the data back into user-friendly format where it is submitted, via the spreadsheet, to be presented in a series of reports and graphics.

1. Report Generator

Here, managerial information about the relative efficiency is detailed. Additionally, relative trade-offs of the media and other inputs are provided in the form of "potential value if efficient" calculations. Input wastages or shortfalls are identified, along with those efficient battalions that provide the comparison (or "facet") sets for the DEA calculation. By use of the information so far developed and by making additional calculations, detailed information on possible improvements in the relative efficiency of *each battalion* is gained, plus the previously mentioned "envelopment map" developed from the efficient comparison sets.

2. Graphics Module

This module provides a series of two-dimensional graphs depicting each input in the analysis plotted against GSMA contracts, the output. Each efficient battalion, as determined by the DEA, is presented as a flashing battalion code. Inefficient battalions are depicted as red battalion codes, while, "potential value if efficient" (the efficiency projection) is presented in white. In the case of overlapping symbols, where two or more battalions are demonstrating similar input-output combinations, each battalion can be displayed sequentially. This allows the user to display each battalion one at a time, thus removing any masking caused by the overlap. This graphic analysis also allows the user to explore trends between the input-output pairs. In effect, these graphics actually portray two-dimensional projections of the efficiency frontier.

Analysis Module

This module provides the totally unprecedented goal programming enhancements to the DEA methodology for the specific case of the new aggregative desired at this time by USAREC. The general theory and other aspects of this pioneering study, which have been developed by non-USAREC-funded research efforts, are scheduled for appearance in the scholarly scientific

literature. The module supplied to USAREC provides for "quick and dirty" analysis of the impact of *reasonable* changes in an advertising (or other) resource on the output of the DEA (in this case, GSMA contracts). Upon initial selection of this module, the goal program described in VII is developed from the data provided by the DEA module and solved. The elasticities developed for each input are then stored for use in assessing change.

A menu box is provided that allows the user to change any or all of the inputs by a factor. This factor must represent *small* changes in the data, as the goal program develops a *local* estimate of the production function involved. This production function estimate includes the approximation of awareness provided by advertising and also the impact of the other inputs. Hence, as with any formulae describing rates of change, change estimates are valid only within a neighborhood of the points specified in determining the formulae. Upon selecting changes, the factor, the elasticity and the original input values for each input are used in software keyed to the simple formulae [8]. Assuming efficiency, a new output value is developed, reflecting the proposed change in the inputs. Change in the output (e.g., reduction in GSMA contracts to be attained) and associated impact on a *single* input can also be assessed.

In summary, the ADEFF system allows for high-resolution analysis of individual battalion efficiencies *and* properly aggregated command-level information on the impact of change in resource levels as well as contract production requirements under the restrictions mentioned.

IX. Analysis

The experimental runs mentioned in Section V of this report resulted in a new DEA model, also described earlier. Then, using the newly developed models and software system described in Section VIII, a detailed analysis of quarter 1 of FY90 was undertaken. This analysis will be discussed first in terms of the high-resolution DEA analysis at the battalion level, and then at the macro level in terms of the results (elasticities, etc.) from the new facility for aggregative change sensitivity (rates-of-change) analysis.

High Resolution at Battalion Level

1. Executive Summary

The analysis indicates that 25 of the 53 battalions were efficient in the first quarter of FY90. Additionally, the information in table 3 reveals the overall efficiency of the 53 battalions and aggregate advertising media.

Table 3. DEA executive summary

ANALYSIS PERIOD: QTR 1 FY 1990	
NUMBER OF BNS IN ANALYSIS PERIOD:	53
NUMBER OF EFFICIENT BNS:	25
EFFICIENCY RANGE:	.1196
EFFICIENCY SD:	.0403
EFFICIENCY MEDIAN:	.9402

****

TOTAL GSMA CONTRACTS IF EFFICIENT:	13453.02
POTENTIAL IMPROVEMENT IF EFFICIENT:	194.02
% CHANGE FROM ACTUAL:	1.46
TOTAL NATIONAL GRPS IF EFFICIENT:	437233.90
% CHANGE FROM ACTUAL:	-37.88
TOTAL LMPS EXPENDITURES IF EFFICIENT:	1116875.86
% CHANGE FROM ACTUAL:	-7.42

****

2. Advertising Effectiveness Indicators

For the 28 inefficient battalions, the Local Media Payment System (LMPS) achieved the highest dual variable value (with 0 slack) 11 times. Barring certain intrinsic

numerical difficulties and instabilities that need further research, this suggests that the LMPS variable should be explored in depth and in new, more adequate DEA models since it might have the higher rate of change (*in the presence* of the other *synergistic* effects of national advertising) on efficiency than the other advertising input variables. The importance of this input variable and the lack of time and funding for additional new research led us to drop presentation of this phase of the research here.

Regional differences in the use of media were also observed: of the 11 battalions noted above, four were 4th Brigade battalions, four were 6th Brigade battalions, two were 5th Brigade and one was 1st Brigade battalion. As mentioned here and in previous sections of this report, further research is needed to determine the reasons for such regionality.

3. The Robustly Efficient Comparison Set

Table 4 shows the batallions that were included in the robustly efficient comparison set developed for the FY90 first-quarter data set. Note that the battalions selected also fare

Table 4. Robustly efficient comparison set for Q1 of FY90

	NAME	# APPEARANCES	GSMA % ACH	USAREC RANK
6F	LA	31	102.4	26
1D	BRUNSWICK	24	118.6	3
1H	NEWBURGH	24	112.0	10
3K	RICHMOND	16	101.3	28
3G	MIAMI	14	109.0	15
1K	PHILADELPHIA	11	115.6	6
3J	RALEIGH	11	121.9	2
5B	CINCINNATI	11	105.6	23

well in other measures of performance. Each of the battalions achieved at least 100 percent of its assigned GSMA mission during this time period. As has consistently happened in other DEA research, the battalions, selected as relatively robustly efficient and used as comparisons for other battalions were also selected by recruiting managers as being among the top performers. This RECS will also be utilized in the subsequent macro-level analysis for the development of elasticities.

4. Interpreting the Local Advertising Effect

The high-resolution DEA analysis indicated that there *might* be potential for improvement in the overall efficiency of the recruiting battalions by better management of local advertising expenditures. Of course, this indication is dependent on the assumption that the measurement of the effect of local advertising on awareness via dollars expended is appropriate. The indication that improvement in the overall efficiency of a battalion via possible changes in management of local advertising resources is obtained synergistically *in the presence of* the awareness created by the national advertising resources (GRPs). This indication should not be confused with the idea that local advertising *itself* is a relatively more important resource available to the recruiter than, say, national advertising resources (at the battalion level). In other words, the DEA highlights the thought of looking into better use of local advertising resources to "exploit the success" of a successful battalion (in producing contracts) or to "reinforce" a battalion that may be failing to achieve its mission. In summary, the DEA has "flagged" this input as one that may need further study and refinement of the manner in which its effect is measured and incorporated into the DEA (and managed).

On the surface, this overall concept, although intuitively pleasing, seems *not* to agree with the recruiting and advertising experts at USAREC. These individuals question the measurement (mentioned above as an assumption) of the local advertising input in terms

of dollars, the only available measurement today, stating that "a dollar of local advertising in Boston is not equal to a dollar of local advertising in Dallas."

There are, however, at least two major points of misunderstanding here. One is that it has been forgotten that the DEA measures effects battalion by battalion, i.e., the results (GRPs) from the different national advertising expenditures are not equal in Boston and Dallas, either. Likewise, a recruiter in Boston may not be equal to a recruiter in Los Angeles, particularly if the LA recruiter is Hispanic and "working" a Hispanic market. The power of the DEA methodology is that such individual differences may be *revealed instead of being concealed in an average, as in regression across all DMUs.*

The second point of misunderstanding relates to different usage of local media by the different battalions. Here, further investigation reveals that the battalion advertising and public affairs (A&PA) specialist and the advertising agency field account executives (FAE) use their expertise in purchasing local media. These individuals purchase local media that is most appropriate for their regional market conditions, in some cases devoting all of the local advertising funds to one medium. These experts, then, by the nature of this allocation process, attempt to capitalize on these market conditions and the prevailing media prices. Thus, the measurement of the resource by dollars should be an appropriate proxy for the awareness generated by the different media, given that the FAE and the A&PA specialist are adequately allocating local advertising resources.

Additionally, analysis of the data for quarter 1 of FY90 indicates that total national GRPs and local advertising expenditures are *approximately* linearly related. "Outliers" do exist (1K, 5A, 1H, 1G, 5F), but only two of these battalions were determined by the DEA analysis to be members of the "robustly efficient comparison set" for the macro analysis at the command level. Remember, too, that this examination of the relationship between local advertising and national media is only in *two* dimensions. The DEA operates in this case in eight dimensions, thus reflecting the additional influence of other resources being expended.

In summary, the DEA analysis *highlights* the local advertising input as one that should require further investigation, not only in the method of measurement, but also in exactly how the resource is being utilized. Again, this demonstrates the ability of the DEA to rapidly discern areas that may need further managerial attention--*not* that local advertising is "better or worse" than any of the other inputs or substitutable for them. Such conclusions are reserved for the USAREC advertising experts. The DEA simply provides a map--by battalion, by resource--of potential improvement for use by the recruiting leadership and management at USAREC.

Macro or Command Level

Now moving from the high-resolution DEA analysis via the RECS to the macro goal programming enhanced analysis level, elasticities are developed for each of the inputs. These elasticities are then used for contingency planning and resource allocation issues.

1. Elasticities for Advertising Inputs

Table 5 indicates the elasticities developed for the first quarter of FY90. These elasticities incorporate in the goal programming enhancement new qualitative information regarding the relative effectiveness of the various media provided by advertising experts at the 31 May 1990 briefing of research results to agency executives. Original estimates presented at earlier briefings to the USAREC staff were based on goal programs that *did not* include additional qualitative constraints suggested at the advertising meeting.

The advertising elasticities in table 5 indicate a higher impact than most other regression-based studies. For example, the unevaluated REARM model used by the USAREC staff provides a coefficient of 0.07 for national advertising. By summing the above national advertising elasticities (a dimensionless measure), national advertising provides a total elasticity of 0.132, indicating that national advertising is more important quantitatively to continued recruiting success than the REARM model estimates.

Table 5. Elasticities for Q1 of FY90

Input	Elasticity
Army Recruiters	.605
DOD Recruiters	.094
Unemployment	.348
LMPS	.005
TV GRP	.112
Radio GRP	.015
Print GRP	.005

2. Downsizing Implications

Utilizing the analysis module further, command-level decision support can be obtained. Discussions with planning groups involved in the proposed "build down" of the recruiting force revealed that the number of recruiters may be reduced from the current 5,554 to 4,900, an 11.8 percent reduction. Using the ADEFF module, such a reduction equates to a 7.3 percent reduction in GSMA contracts, assuming *ceteris paribus* and efficiency. Using the ADEFF module again, one can see *immediately* that this reduction might be offset by a 25 percent increase in national and local advertising, resulting in 12,988 GSMA contracts, which at the time of this report, is a reasonable estimate for the FY91 GSMA mission.

This example demonstrates the usefulness of the ADEFF system in assessing the impact of small, reasonable changes in the data for resource planning during this crucial time of budget reductions.

X. Results

In summary, the analysis has revealed several important aspects in this initial effort to quantify the impact of advertising resources on quality recruiting. First, at the high-resolution battalion level of analysis, the local advertising resource has been flagged by the DEA as offering possibilities for improvement in relative efficiency in different regions of the country. Perhaps the measurement of this resource itself must be improved and shifts in this resource (in the presence of national advertising) should be explored.

The robustly efficient comparison set (RECS) identified by the DEA appears reasonable as a stable "goal" set of battalions for other, inefficient battalions to learn from. Comparison with other data from other USAREC sources corroborates that the DEA does in fact provide reasonable and viable methodology for further analysis and management of recruiting.

As expected, the DEA indicates that regionality is important in understanding the impact of advertising on recruiting.

At the macro or command level, utilization of the newly-developed goal programming enhanced DEA elasticities for advertising appears much higher than previously reported in the literature. Additionally, the ability to include expert information concerning the preemptive ordering of media types in the form of additional constraints in the goal program has been demonstrated. Advertising appears as a key input for recruiting success and is useful in offsetting required build-down scenarios.

XI. Conclusions

This research effort was concluded by responding to an unanticipated need for its application to the pioneering development of a new DEA theory to better measure the impact of advertising resources on high-quality recruiting. Better estimates of awareness (implicitly) produced at the battalion level by national advertising have been achieved through recursive models

that were specifically adapted to the recruiting environment and approximated through goal programming enhancements specialized for this application from those in new general theoretical research. This new theory, which was developed elsewhere has resulted in a system of models that provides both high-resolution information at the battalion level *and* properly aggregated command-level information for policy analysis and decisions. For the first time, the relative impacts of different media at both battalion and command level have begun to be assessed via sound quantitative methods.

This system has been further developed into a user-friendly interface and informatics structure that reflects the latest state-of-the-art developments in information systems. Furthermore, the system provides a PC transportable and compatible implementation for immediate use by USAREC staff to support volatile build-down decision making.

Thus, an application-driven theory has been developed that will have far-reaching implications for this and other resource allocation problems. This exploratory effort has activated continued study for a proper quantification of advertising effectiveness and efficiency.

XII. Directions for Future Research

As a result of this study, several new questions have arisen that may be of crucial importance to recruiting research. Other innovative DEA and goal programming formulations should be explored that incorporate other performance qualities, resources and data detail. For example, the inclusion of direct mail, recruiter write-rates, other advertising activity (such as canvassing), bonus, and incentive effects and data as well as other resource data, requires new investigation and new models.

Resource allocation issues such as facilities planning, marketing and recruiter zone analysis need exploration using the methods and informatics developed thus far.

Methods to further refine the robustly efficient comparison set for disaggregation from the command level need development. Such developments, along with the inclusion of other qualitative and quantitative information and data (in the form of constraints and other known "weightings" that occur in media planning) can also be used to "fine tune" the elasticities provided in the command-level analysis. Additionally, advertising cost issues need be explored and informatics developed to provide easily accessible computer means to further enhance decision making.

This effort serves as the prelude to such exciting research.

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APPENDIX

A. Initial USAREC Data Request

Request the following data from Defense Manpower Data Center as soon as possible. Priority is indicated by the order in the request.

1. The following items are requested by Army recruiting Battalion, by quarter, by Fiscal year, by service (including Joint Recruiting programs) for FY85-FY86:

a. National Advertising Expenditures:

NPS Television
NPS Radio
NPS Magazines
NPS Newspapers
NPS Direct Mail
NPS Outdoor
NPS Supplements
NPS Total Print
NPS Total Electronic
NPS Total Other

b. National Advertising Impressions:

NPS Television
NPS Radio
NPS Magazines
NPS Newspapers
NPS Direct Mail
NPS Outdoor
NPS Supplements
NPS Total Print
NPS Total Electronic
NPS Total Other

c. Local Advertising Expenditures:

NPS Television
NPS Radio
NPS Newspapers
NPS Total Print
NPS Total Electronic
NPS Total Other

d. Direct Mail Leads (qualified)

2. The following items are requested by service, by quarter, by FY for FY87-FY88:

a. National Advertising Expenditures:

NPS Television
NPS Radio
NPS Magazines
NPS Newspapers
NPS Direct Mail
NPS Outdoor
NPS Supplements
NPS Total Print
NPS Total Electronic
NPS Total Other

3. The following items are requested by Army recruiting Battalion, by quarter, by Fiscal year, FY85-FY88:

Army Production Recruiters
Navy Production Recruiters
Air Force Production Recruiters
USMC Production Recruiters
Army I-IIIA Mission
Army I-IIIA Applicants
Army I-IIIA Contracts
Army IIIB Mission
Army IIIB Applicants
Army IIIB Contracts
Army IV Mission
Army IV Applicants
Army IV Contracts
Navy New Contract Mission
Navy I-IIIA Applicants
Navy I-IIIA Contracts
Navy IIIB Applicants
Navy IIIB Contracts
Navy IV Applicants
Navy IV Contracts
Air Force New Contract Mission
Air Force I-IIIA Applicants
Air Force I-IIIA Contracts
Air Force IIIB Applicants
Air Force IIIB Contracts
Air Force IV Applicants
Air Force IV Contracts
USMC New Contract Mission
USMC I-IIIA Applicants
USMC I-IIIA Contracts
USMC IIIB Applicants
USMC IIIB Contracts
USMC IV Applicants
USMC IV Contracts

Subsequent data will be needed as the research progresses.

B. Data Summaries

1. General Data Description.

111-Jun-90 DATA SUMMARY: ADEFF DATABASE, QTRS 2,3,4 FY89, QTR1 FY90
07:43:48 GSMA HSMMA ARRCTR DODRCTR CDODRCTR UNEM TO PROP

BN	FY	QTR	FYQTR	GSMA	HSMMA	ARRCTR	DODRCTR	CDODRCTR	UNEM	RCTREX	PROP
1A	1989	2	198914	155	10753	73	63	459.00	52	741	113
1A	1989	3	198915	134	10753	71	65	457.00	51	674	113
1A	1989	4	198916	142	10753	69	59	463.00	48	677	113
1A	1990	1	199013	146	10753	68	59	463.00	48	709	113
1B	1989	2	198914	256	35501	149	173	349.00	37	664	139
1B	1989	3	198915	230	35501	146	182	340.00	38	743	139
1B	1989	4	198916	240	35501	148	181	341.00	34	765	139
1B	1990	1	199013	326	35501	145	177	345.00	36	755	139
1C	1989	2	198914	178	26921	110	145	377.00	39	722	108
1C	1989	3	198915	138	26921	103	139	383.00	37	710	108
1C	1989	4	198916	143	26921	102	130	392.00	42	671	108
1C	1990	1	199013	221	26921	101	130	392.00	42	697	108
1D	1989	2	198914	154	14147	58	57	465.00	36	728	119
1D	1989	3	198915	97	14147	54	57	465.00	35	737	119
1D	1989	4	198916	164	14147	56	55	467.00	34	693	119
1D	1990	1	199013	198	14147	60	55	467.00	34	686	119
1E	1989	2	198914	272	26904	118	140	382.00	49	693	115
1E	1989	3	198915	166	26904	117	144	378.00	45	667	115
1E	1989	4	198916	230	26904	121	146	376.00	43	618	115
1E	1990	1	199013	260	26904	118	146	376.00	43	648	115
1F	1989	2	198914	114	18195	73	101	421.00	37	599	118
1F	1989	3	198915	89	18195	82	111	411.00	34	613	118
1F	1989	4	198916	94	18195	88	74	448.00	40	634	118
1F	1990	1	199013	149	18195	81	74	448.00	40	655	118
1G	1989	2	198914	179	23350	136	181	341.00	41	714	140
1G	1989	3	198915	173	23350	133	180	342.00	42	692	140
1G	1989	4	198916	178	23350	127	151	371.00	43	667	140
1G	1990	1	199013	231	23350	136	151	371.00	43	648	140
1H	1989	2	198914	162	28526	113	149	373.00	45	740	134
1H	1989	3	198915	124	28526	109	150	372.00	43	748	134
1H	1989	4	198916	115	28526	107	129	393.00	47	753	134
1H	1990	1	199013	196	28526	110	129	393.00	47	682	134
1K	1989	2	198914	153	24221	116	145	377.00	40	692	91
1K	1989	3	198915	149	24221	107	156	366.00	37	707	91
1K	1989	4	198916	145	24221	95	158	364.00	40	667	91
1K	1990	1	199013	189	24221	110	158	364.00	40	631	91
1L	1989	2	198914	277	28332	124	197	325.00	62	675	186
1L	1989	3	198915	214	28332	124	187	335.00	56	604	186
1L	1989	4	198916	230	28332	123	195	327.00	51	532	186
1L	1990	1	199013	273	28332	135	195	327.00	51	571	186
1N	1989	2	198914	300	27992	127	164	358.00	58	738	130
1N	1989	3	198915	242	27992	128	178	344.00	54	727	130
1N	1989	4	198916	277	27992	122	175	347.00	50	745	130

BN	FY	QTR	FYQTR	GSMA	HSMMA	ARRCTR	DODRCTR	CDODRCTR	UNEM	RCTREX	PROP
1N	1990	1	199013	309	27992	123	175	347.00	50	760	130
3A	1989	2	198914	290	18286	108	172	350.00	53	637	186
3A	1989	3	198915	219	18286	103	170	352.00	55	628	186
3A	1989	4	198916	223	18286	99	188	334.00	57	625	186
3A	1990	1	199013	268	18286	101	188	334.00	57	683	186
3B	1989	2	198914	197	12024	66	78	444.00	68	601	241
3B	1989	3	198915	127	12024	59	79	443.00	61	560	241
3B	1989	4	198916	179	12024	65	85	437.00	53	572	241
3B	1990	1	199013	187	12024	67	85	437.00	53	622	241
3C	1989	2	198914	194	13384	73	102	420.00	38	772	164
3C	1989	3	198915	154	13384	73	104	418.00	37	726	164
3C	1989	4	198916	130	13384	77	120	402.00	35	723	164
3C	1990	1	199013	204	13384	83	120	402.00	35	677	164
3D	1989	2	198914	201	12410	72	129	393.00	48	711	219
3D	1989	3	198915	156	12410	78	139	383.00	45	684	219
3D	1989	4	198916	169	12410	75	139	383.00	49	664	219
3D	1990	1	199013	193	12410	80	139	383.00	49	636	219
3E	1989	2	198914	339	18334	128	169	353.00	52	623	172
3E	1989	3	198915	269	18334	125	176	346.00	56	688	172
3E	1989	4	198916	298	18334	114	175	347.00	55	741	172
3E	1990	1	199013	403	18334	124	175	347.00	55	782	172
3F	1989	2	198914	213	15168	86	90	432.00	71	691	178
3F	1989	3	198915	156	15168	86	97	425.00	60	680	178
3F	1989	4	198916	212	15168	84	94	428.00	53	678	178
3F	1990	1	199013	250	15168	88	94	428.00	53	713	178
3G	1989	2	198914	339	18792	106	122	400.00	54	720	201
3G	1989	3	198915	252	18792	104	122	400.00	60	708	201
3G	1989	4	198916	309	18792	110	137	385.00	60	697	201
3G	1990	1	199013	399	18792	119	137	385.00	60	646	201
3H	1989	2	198914	246	17288	92	135	387.00	74	601	249
3H	1989	3	198915	208	17288	91	146	376.00	66	600	249
3H	1989	4	198916	239	17288	99	158	364.00	72	622	249
3H	1990	1	199013	282	17288	95	158	364.00	72	694	249
3I	1989	2	198914	238	15602	86	119	403.00	63	662	199
3I	1989	3	198915	226	15602	88	127	395.00	57	634	199
3I	1989	4	198916	215	15602	84	143	379.00	50	642	199
3I	1990	1	199013	268	15602	90	143	379.00	50	697	199
3J	1989	2	198914	186	9071	70	84	438.00	39	632	251
3J	1989	3	198915	153	9071	73	85	437.00	38	638	251
3J	1989	4	198916	188	9071	67	99	423.00	35	682	251
3J	1990	1	199013	206	9071	66	99	423.00	35	675	251
3K	1989	2	198914	227	13924	70	110	412.00	45	720	198
3K	1989	3	198915	180	13924	64	118	404.00	37	665	198
3K	1989	4	198916	162	13924	70	134	388.00	35	655	198
3K	1990	1	199013	235	13924	70	134	388.00	35	661	198
5A	1989	2	198914	201	17382	131	172	350.00	58	738	131
5A	1989	3	198915	162	17382	137	175	347.00	56	743	131
5A	1989	4	198916	169	17382	130	189	333.00	54	710	131
5A	1990	1	199013	227	17382	131	189	333.00	54	750	131
5B	1989	2	198914	185	20630	82	85	437.00	58	769	128
5B	1989	3	198915	114	20630	81	93	429.00	52	760	128
5B	1989	4	198916	158	20630	77	98	424.00	46	722	128
5B	1990	1	199013	171	20630	70	98	424.00	46	720	128

BN	FY	QTR	FYQTR	GSMA	HSMMA	ARRCTR	DODRCTR	CDODRCTR	UNEM	RCTREX	PROP
5C	1989	2	198914	294	28605	130	182	340.00	62	785	110
5C	1989	3	198915	203	28605	128	195	327.00	57	751	110
5C	1989	4	198916	219	28605	131	208	314.00	54	782	110
5C	1990	1	199013	219	28605	133	208	314.00	54	748	110
5D	1989	2	198914	180	21483	84	106	416.00	56	793	164
5D	1989	3	198915	128	21483	80	115	407.00	51	806	164
5D	1989	4	198916	172	21483	80	122	400.00	47	746	164
5D	1990	1	199013	172	21483	86	122	400.00	47	767	164
5E	1989	2	198914	130	19618	84	76	446.00	45	781	128
5E	1989	3	198915	98	19618	78	72	450.00	38	744	128
5E	1989	4	198916	152	19618	77	80	442.00	37	753	128
5E	1990	1	199013	152	19618	76	80	442.00	37	718	128
5F	1989	2	198914	231	22119	116	161	361.00	71	784	126
5F	1989	3	198915	161	22119	122	168	354.00	67	715	126
5F	1989	4	198916	197	22119	127	178	344.00	73	706	126
5F	1990	1	199013	197	22119	126	178	344.00	73	682	126
5H	1989	2	198914	205	19271	102	117	405.00	48	699	138
5H	1989	3	198915	159	19271	108	125	397.00	35	750	138
5H	1989	4	198916	189	19271	102	130	392.00	40	734	138
5H	1990	1	199013	189	19271	105	130	392.00	40	676	138
5I	1989	2	198914	321	26781	129	133	389.00	73	726	114
5I	1989	3	198915	251	26781	138	143	379.00	66	709	114
5I	1989	4	198916	255	26781	127	148	374.00	69	644	114
5I	1990	1	199013	255	26781	124	148	374.00	69	662	114
5J	1989	2	198914	226	35001	110	136	386.00	49	642	113
5J	1989	3	198915	165	35001	114	133	389.00	43	672	113
5J	1989	4	198916	228	35001	115	144	378.00	40	710	113
5J	1990	1	199013	243	35001	117	144	378.00	40	695	113
5K	1989	2	198914	239	25637	127	139	383.00	48	736	162
5K	1989	3	198915	195	25637	124	134	388.00	46	758	162
5K	1989	4	198916	248	25637	117	152	370.00	40	759	162
5K	1990	1	199013	290	25637	114	152	370.00	40	750	162
5L	1989	2	198914	208	23697	103	126	396.00	43	678	117
5L	1989	3	198915	163	23697	100	116	406.00	35	675	117
5L	1989	4	198916	244	23697	105	130	392.00	34	671	117
5L	1990	1	199013	247	23697	105	130	392.00	34	706	117
5M	1989	2	198914	147	23590	105	116	406.00	60	750	177
5M	1989	3	198915	163	23590	105	118	404.00	54	767	177
5M	1989	4	198916	178	23590	102	126	396.00	53	732	177
5M	1990	1	199013	198	23590	95	126	396.00	53	686	177
4A	1989	2	198914	190	11998	80	100	422.00	76	694	188
4A	1989	3	198915	154	11998	83	102	420.00	71	678	188
4A	1989	4	198916	202	11998	83	113	409.00	68	650	188
4A	1990	1	199013	212	11998	85	113	409.00	68	705	188
4C	1989	2	198914	385	26592	132	151	371.00	67	703	143
4C	1989	3	198915	316	26592	134	152	370.00	63	670	143
4C	1989	4	198916	392	26592	138	167	355.00	66	654	143
4C	1990	1	199013	382	26592	141	167	355.00	66	635	143
4D	1989	2	198914	241	21660	95	147	375.00	75	624	170
4D	1989	3	198915	224	21660	93	142	380.00	63	679	170
4D	1989	4	198916	252	21660	95	148	374.00	48	672	170
4D	1990	1	199013	285	21660	105	148	374.00	48	643	170
4E	1989	2	198914	309	19120	107	136	386.00	70	591	164

BN	FY	QTR	FYQTR	GSMA	HSMMA	ARRCTR	DODRCTR	CDODRCTR	UNEM	RCTREX	PROP
4E	1989	3	198915	225	19120	106	147	375.00	66	610	164
4E	1989	4	198916	263	19120	105	154	368.00	68	736	164
4E	1990	1	199013	333	19120	120	154	368.00	68	652	164
4F	1989	2	198914	211	12046	92	138	384.00	83	788	218
4F	1989	3	198915	156	12046	93	127	395.00	79	735	218
4F	1989	4	198916	183	12046	98	145	377.00	68	724	218
4F	1990	1	199013	244	12046	101	145	377.00	68	666	218
4G	1989	2	198914	308	24615	112	124	398.00	55	614	89
4G	1989	3	198915	236	24615	108	130	392.00	46	719	89
4G	1989	4	198916	294	24615	111	131	391.00	45	745	89
4G	1990	1	199013	342	24615	112	131	391.00	45	677	89
4H	1989	2	198914	209	13141	85	108	414.00	89	674	166
4H	1989	3	198915	182	13141	78	111	411.00	86	730	166
4H	1989	4	198916	198	13141	77	121	401.00	71	760	166
4H	1990	1	199013	245	13141	103	121	401.00	71	598	166
4I	1989	2	198914	200	10447	72	161	361.00	105	622	178
4I	1989	3	198915	173	10447	78	121	401.00	92	620	178
4I	1989	4	198916	158	10447	75	128	394.00	84	600	178
4I	1990	1	199013	208	10447	74	128	394.00	84	630	178
4J	1989	2	198914	223	17700	76	110	412.00	68	658	183
4J	1989	3	198915	201	17700	69	114	408.00	59	596	183
4J	1989	4	198916	240	17700	67	120	402.00	54	653	183
4J	1990	1	199013	247	17700	76	120	402.00	54	548	183
4K	1989	2	198914	291	14660	100	129	393.00	73	691	244
4K	1989	3	198915	285	14660	96	127	395.00	69	697	244
4K	1989	4	198916	270	14660	98	137	385.00	72	636	244
4K	1990	1	199013	317	14660	103	137	385.00	72	704	244
4N	1989	2	198914	282	26468	137	170	352.00	67	772	164
4N	1989	3	198915	263	26468	145	171	351.00	56	759	164
4N	1989	4	198916	252	26468	130	191	331.00	54	742	164
4N	1990	1	199013	307	26468	133	191	331.00	54	683	164
6A	1989	2	198914	155	20005	123	167	355.00	46	621	114
6A	1989	3	198915	181	20005	123	159	363.00	45	653	114
6A	1989	4	198916	216	20005	127	141	381.00	41	741	114
6A	1990	1	199013	202	20005	125	141	381.00	41	838	114
6F	1989	2	198914	203	32603	168	226	296.00	42	685	177
6F	1989	3	198915	222	32603	162	223	299.00	47	708	177
6F	1989	4	198916	226	32603	169	261	261.00	50	693	177
6F	1990	1	199013	340	32603	173	261	261.00	50	704	177
6G	1989	2	198914	232	13971	89	122	400.00	58	682	165
6G	1989	3	198915	205	13971	86	122	400.00	52	680	165
6G	1989	4	198916	272	13971	90	128	394.00	59	675	165
6G	1990	1	199013	291	13971	92	128	394.00	59	734	165
6H	1989	2	198914	213	21175	73	86	436.00	62	742	104
6H	1989	3	198915	122	21175	73	85	437.00	54	728	104
6H	1989	4	198916	233	21175	74	94	428.00	50	769	104
6H	1990	1	199013	207	21175	76	94	428.00	50	687	104
6I	1989	2	198914	265	24364	101	135	387.00	81	692	135
6I	1989	3	198915	197	24364	106	137	385.00	75	658	135
6I	1989	4	198916	256	24364	102	120	402.00	66	680	135
6I	1990	1	199013	278	24364	110	120	402.00	66	649	135
6J	1989	2	198914	272	25480	81	132	390.00	61	676	118
6J	1989	3	198915	214	25480	79	128	394.00	51	681	118

BN	FY	QTR	FYQTR	GSMA	HSMMA	ARRCTR	DODRCTR	CDODRCTR	UNEM	RCTREX	PROP
6J	1989	4	198916	206	25480	78	140	382.00	44	624	118
6J	1990	1	199013	195	25480	82	140	382.00	44	617	118
6K	1989	2	198914	314	31870	136	181	341.00	42	610	141
6K	1989	3	198915	239	31870	146	182	340.00	45	593	141
6K	1989	4	198916	293	31870	149	199	323.00	47	639	141
6K	1990	1	199013	344	31870	149	199	323.00	47	650	141
6L	1989	2	198914	331	24790	135	158	364.00	67	731	105
6L	1989	3	198915	255	24790	135	149	373.00	56	708	105
6L	1989	4	198916	306	24790	133	174	348.00	54	705	105
6L	1990	1	199013	327	24790	142	174	348.00	54	713	105

BN	FY	QTR	FYQTR	LMPS	CATVGRP	NETVGRP	BRDGRP	MAGGRP	RADGRP	TOTGRP
1A	1989	2	198914	21701	372	1025	1397	791	1975	5560
1A	1989	3	198915	21400	397	393	791	792	2558	4931
1A	1989	4	198916	10413	128	225	353	337	132	822
1A	1990	1	199013	20594	520	778	1298	5428	2900	10924
1B	1989	2	198914	48469	562	6560	7122	1423	3177	18844
1B	1989	3	198915	51181	577	1502	2079	1427	8490	14076
1B	1989	4	198916	25658	355	723	1078	1081	733	2892
1B	1990	1	199013	24823	860	3914	4774	6113	7433	23094
1C	1989	2	198914	34212	266	603	869	698	1805	4242
1C	1989	3	198915	43530	298	629	927	698	1930	4483
1C	1989	4	198916	22299	208	399	607	531	1420	2557
1C	1990	1	199013	24688	927	1340	2267	5602	1354	11489
1D	1989	2	198914	18751	709	1476	2185	914	919	6203
1D	1989	3	198915	15662	793	814	1607	913	1323	5449
1D	1989	4	198916	10662	378	2639	3017	711	1302	5030
1D	1990	1	199013	16608	927	1340	2267	5602	1354	11489
1E	1989	2	198914	46595	848	1417	2265	1019	4094	9643
1E	1989	3	198915	33242	865	869	1733	1019	5515	10001
1E	1989	4	198916	18154	584	768	1351	802	2069	4223
1E	1990	1	199013	24535	1215	2758	3973	5900	4427	18273
1F	1989	2	198914	25622	438	686	1124	873	2340	5462
1F	1989	3	198915	19691	461	736	1197	873	3003	6269
1F	1989	4	198916	11230	341	332	674	661	1635	2971
1F	1990	1	199013	20116	644	1666	2310	4492	3405	12518
1G	1989	2	198914	31916	65	377	442	212	605	1701
1G	1989	3	198915	29172	78	241	319	212	731	1581
1G	1989	4	198916	19952	53	181	234	159	344	737
1G	1990	1	199013	28577	93	523	615	972	855	3058
1H	1989	2	198914	49528	52	301	352	168	492	1365
1H	1989	3	198915	30378	62	191	253	168	587	1260
1H	1989	4	198916	20808	42	142	184	126	272	583
1H	1990	1	199013	25080	74	417	491	768	679	2430
1K	1989	2	198914	33684	80	442	522	201	1239	2483
1K	1989	3	198915	27795	73	214	287	201	1100	1876
1K	1989	4	198916	20589	52	103	155	156	337	649
1K	1990	1	199013	22373	116	649	765	851	900	3280
1L	1989	2	198914	34810	1455	3682	5137	1353	3301	14929
1L	1989	3	198915	45105	1508	1665	3173	1333	4219	11897
1L	1989	4	198916	31107	966	1410	2376	1039	868	4283
1L	1990	1	199013	24764	2027	3318	5345	6600	3977	21267
1N	1989	2	198914	50286	1771	5935	7705	2148	4783	22342
1N	1989	3	198915	36638	1883	1655	3538	2148	4254	13478
1N	1989	4	198916	31654	1204	1217	2421	1752	3340	7513
1N	1990	1	199013	29931	2498	4545	7043	19024	4513	37624
3A	1989	2	198914	23128	912	3740	4653	831	2562	12698
3A	1989	3	198915	21094	975	1161	2135	883	2551	7705
3A	1989	4	198916	13545	391	1665	2056	687	1774	4517
3A	1990	1	199013	32004	1110	2787	3897	3862	2213	9972
3B	1989	2	198914	20273	1087	1831	2918	720	4174	10729
3B	1989	3	198915	11441	1070	687	1757	979	7409	11902
3B	1989	4	198916	15625	567	757	1324	754	992	3070
3B	1990	1	199013	17719	1231	1587	2818	2988	3691	12314
3C	1989	2	198914	10531	470	1956	2426	664	1917	7433

BN	FY	QTR	FYQTR	GSMA	HSMMA	ARRCTR	DODRCTR	CDODRCTR	UNEM	RCTREX	PROP
3C	1989	3	198915	21991	519	739	1258	590	1877		4983
3C	1989	4	198916	8738	298	574	872	473	1447		2792
3C	1990	1	199013	15466	643	1497	2140	3288	3308		10876
3D	1989	2	198914	9003	1261	3200	4461	1144	3480		13547
3D	1989	3	198915	24039	1185	1199	2384	1163	3715		9647
3D	1989	4	198916	14565	575	1424	1999	903	4182		7084
3D	1990	1	199013	23776	1504	5042	6545	6594	7134		20274
3E	1989	2	198914	27974	1593	4903	6497	1514	3212		17719
3E	1989	3	198915	28266	1473	1502	2976	1524	4742		12217
3E	1989	4	198916	17230	786	4432	5218	1177	1511		7906
3E	1990	1	199013	41478	1625	2908	4533	6224	3790		19081
3F	1989	2	198914	16586	848	4989	5837	822	4564		17060
3F	1989	3	198915	16454	863	1027	1890	826	4217		8823
3F	1989	4	198916	17388	462	785	1247	643	1612		3503
3F	1990	1	199013	24082	1148	1717	2866	4172	3181		13084
3G	1989	2	198914	25819	1001	2383	3384	1992	3829		12589
3G	1989	3	198915	28119	837	1734	2572	1789	5359		12291
3G	1989	4	198916	20811	570	2759	3329	1544	1480		6352
3G	1990	1	199013	23886	1238	3341	4579	7079	3164		19401
3H	1989	2	198914	20979	1673	4744	6417	1291	4225		18350
3H	1989	3	198915	22847	1581	2430	4011	1715	1491		11227
3H	1989	4	198916	25004	849	3093	3942	1358	1075		6376
3H	1990	1	199013	18545	2063	4030	6093	5898	2493		20577
3I	1989	2	198914	16250	1060	3153	4213	1078	3072		12575
3I	1989	3	198915	11460	1128	1355	2483	1078	3640		9685
3I	1989	4	198916	17552	645	2307	2953	832	2264		6049
3I	1990	1	199013	19406	1453	2522	3975	5947	3850		17746
3J	1989	2	198914	14771	589	2558	3147	843	2622		9759
3J	1989	3	198915	16201	657	1061	1718	743	2168		6347
3J	1989	4	198916	13202	356	1004	1360	593	1170		3123
3J	1990	1	199013	15626	782	2241	3022	3670	2010		11725
3K	1989	2	198914	25896	941	4031	4973	1193	3414		14553
3K	1989	3	198915	18824	1096	1532	2628	1479	2430		9164
3K	1989	4	198916	7267	543	825	1368	939	1112		3420
3K	1990	1	199013	22508	1417	2583	4000	4059	2364		14422
5A	1989	2	198914	23381	68	948	1016	230	325		2588
5A	1989	3	198915	33891	73	520	593	230	266		1682
5A	1989	4	198916	89848	47	341	388	182	208		779
5A	1990	1	199013	23823	97	845	942	938	447		3268
5B	1989	2	198914	49948	306	1111	1418	574	756		4165
5B	1989	3	198915	26250	310	755	1065	578	771		3480
5B	1989	4	198916	49002	183	912	1095	436	579		2111
5B	1990	1	199013	16443	424	1824	2248	2769	949		8214
5C	1989	2	198914	38505	532	2265	2797	833	3477		9904
5C	1989	3	198915	44873	526	1189	1714	832	3860		8122
5C	1989	4	198916	90766	333	637	970	660	791		2421
5C	1990	1	199013	18950	750	2707	3457	3936	4823		15673
5D	1989	2	198914	40023	1537	8374	9910	1823	5602		27245
5D	1989	3	198915	23169	1543	1090	2634	1625	3779		10671
5D	1989	4	198916	59813	817	941	1758	1238	424		3420
5D	1990	1	199013	19850	2084	3932	6016	9778	1641		23452
5E	1989	2	198914	26445	655	3110	3766	1100	6471		15103
5E	1989	3	198915	24520	787	1452	2239	1066	10793		16338

BN	FY	QTR	FYQTR	GSMA	HSMMA	ARRCTR	DODRCTR	CDODRCTR	UNEM	RCTREX	PROP
5E	1989	4	198916	52548	435	1341	1776	840	1270	3887
5E	1990	1	199013	20540	898	3259	4156	6273	2913	17498
5F	1989	2	198914	52992	111	612	724	317	1689	3453
5F	1989	3	198915	34518	119	609	728	317	1886	3659
5F	1989	4	198916	54571	71	263	333	252	207	792
5F	1990	1	199013	30634	154	764	918	1378	1208	4421
5H	1989	2	198914	31393	801	4738	5539	1095	3783	15956
5H	1989	3	198915	37225	865	1682	2547	1096	4016	10206
5H	1989	4	198916	65526	547	994	1540	874	1105	3519
5H	1990	1	199013	11758	1126	2609	3735	6048	3958	17477
5I	1989	2	198914	25927	787	3616	4403	1539	5929	16274
5I	1989	3	198915	17404	901	1668	2569	1408	6153	12699
5I	1989	4	198916	75319	526	1100	1626	1086	2335	5047
5I	1990	1	199013	35041	1219	3612	4830	6624	5917	22201
5J	1989	2	198914	30727	883	2594	3478	1699	2614	11268
5J	1989	3	198915	37727	986	2203	3189	1555	4434	12367
5J	1989	4	198916	88827	583	1487	2070	1216	1769	5055
5J	1990	1	199013	23919	1229	6171	7399	9298	3429	27526
5K	1989	2	198914	39510	729	3849	4578	1539	2731	13427
5K	1989	3	198915	33998	813	2139	2951	1495	6023	13420
5K	1989	4	198916	95434	444	1029	1473	1154	1228	3856
5K	1990	1	199013	36363	1094	5564	6658	7279	3006	23601
5L	1989	2	198914	53334	1644	4603	6247	2340	6244	21079
5L	1989	3	198915	21667	1597	3221	4818	2137	7048	18822
5L	1989	4	198916	67028	866	2787	3653	1700	2475	7829
5L	1990	1	199013	32296	2831	5661	8491	11915	3533	32432
5M	1989	2	198914	40880	591	3387	3978	1083	2355	11394
5M	1989	3	198915	25825	648	1348	1997	1083	1960	7036
5M	1989	4	198916	61904	368	2453	2821	843	749	4413
5M	1990	1	199013	20690	807	3085	3892	6727	2143	16654
4A	1989	2	198914	30785	1186	2830	4017	1130	4643	13806
4A	1989	3	198915	21652	1244	2729	3973	1035	3288	12270
4A	1989	4	198916	24697	662	2987	3649	830	2412	6890
4A	1990	1	199013	17283	1911	3983	5893	4818	3010	19616
4C	1989	2	198914	34868	783	3519	4302	794	2031	11428
4C	1989	3	198915	38768	897	1785	2682	792	1262	7418
4C	1989	4	198916	50730	470	1205	1675	618	960	3252
4C	1990	1	199013	36793	788	2854	3642	4840	1428	13551
4D	1989	2	198914	21480	1539	4607	6146	1812	3256	17360
4D	1989	3	198915	26413	1441	2439	3881	1643	5372	14777
4D	1989	4	198916	35521	935	2441	3376	1298	1491	6164
4D	1990	1	199013	22163	1861	6071	7932	10323	4021	30207
4E	1989	2	198914	26147	876	2929	3806	834	1960	10405
4E	1989	3	198915	39446	809	1343	2151	787	2619	7710
4E	1989	4	198916	30740	416	872	1288	597	1293	3178
4E	1990	1	199013	27040	1161	2354	3515	4739	1375	13145
4F	1989	2	198914	41548	1802	7027	8830	1432	6951	26043
4F	1989	3	198915	31801	1870	2604	4474	1683	7386	18018
4F	1989	4	198916	23411	887	4994	5881	1315	2138	9335
4F	1990	1	199013	19365	2207	5284	7490	9747	7431	32158
4G	1989	2	198914	34876	1260	4516	5776	1726	7853	21131
4G	1989	3	198915	39535	1330	2652	3983	1779	4453	14198
4G	1989	4	198916	36652	727	1449	2176	1366	2455	5996

BN	FY	QTR	FYQTR	GSMA	HSMMA	ARRCTR	DODRCTR	CDODRCTR	UNEM	RCTREX	PROP
4G	1990	1	199013	32855	1893	3287	5179	7559		3989	21906
4H	1989	2	198914	53556	1415	4536	5951	1127		3695	16725
4H	1989	3	198915	28205	1641	2846	4487	1287		6452	16713
4H	1989	4	198916	27698	906	1417	2323	982		2811	6116
4H	1990	1	199013	18765	1784	4358	6143	3887		4787	20959
4I	1989	2	198914	35841	972	3282	4254	659		4790	13958
4I	1989	3	198915	19657	1093	2250	3343	809		3129	10624
4I	1989	4	198916	23645	630	1043	1672	630		489	2792
4I	1990	1	199013	16172	1292	4401	5693	4349		4781	20516
4J	1989	2	198914	36038	1233	4386	5619	1159		3119	15516
4J	1989	3	198915	26775	1158	2128	3286	1006		3910	11490
4J	1989	4	198916	32383	653	978	1631	810		1967	4408
4J	1990	1	199013	19181	1463	3214	4677	5898		4600	19852
4K	1989	2	198914	36998	1997	4937	6934	1328		5239	20435
4K	1989	3	198915	14571	1720	3644	5365	1594		5375	17699
4K	1989	4	198916	40119	987	2380	3367	1261		1567	6196
4K	1990	1	199013	16213	2224	6631	8855	8361		2896	28967
4N	1989	2	198914	39471	1186	2830	4017	1130		4643	13806
4N	1989	3	198915	44253	981	2322	3303	1084		2842	10531
4N	1989	4	198916	40503	574	1283	1857	857		2057	4771
4N	1990	1	199013	34247	1138	2687	3824	6058		3312	17018
6A	1989	2	198914	30614	331	886	1217	733		450	3617
6A	1989	3	198915	32674	312	1049	1361	733		616	4071
6A	1989	4	198916	29856	222	627	849	552		261	1662
6A	1990	1	199013	17731	460	1516	1976	4094		1365	9410
6F	1989	2	198914	29356	277	1018	1294	543		1287	4419
6F	1989	3	198915	26335	275	670	946	543		1133	3567
6F	1989	4	198916	26227	197	439	636	408		577	1621
6F	1990	1	199013	18301	402	941	1344	3675		1151	7513
6G	1989	2	198914	24275	774	4254	5028	1363		1045	12464
6G	1989	3	198915	18257	825	1606	2431	1279		1504	7645
6G	1989	4	198916	14210	520	1175	1695	999		632	3326
6G	1990	1	199013	17533	948	3117	4065	6460		1214	15804
6H	1989	2	198914	14538	725	1479	2203	1544		2046	7997
6H	1989	3	198915	23888	920	2162	3081	1540		3331	11033
6H	1989	4	198916	14277	525	794	1319	1202		2200	4721
6H	1990	1	199013	15579	1254	2539	3792	7169		4847	19601
6I	1989	2	198914	25391	1377	2390	3767	2045		2719	12299
6I	1989	3	198915	25998	1430	1736	3165	2033		2991	11354
6I	1989	4	198916	22600	932	1935	2867	1553		1043	5463
6I	1990	1	199013	18225	1751	4469	6220	11789		3722	27951
6J	1989	2	198914	29996	2129	5945	8074	3146		4945	24239
6J	1989	3	198915	29539	2354	4586	6940	3003		5665	22548
6J	1989	4	198916	19751	1278	3965	5242	2388		1171	8801
6J	1990	1	199013	16904	3026	7012	10038	16477		2343	38896
6K	1989	2	198914	24026	655	2338	2993	910		675	7570
6K	1989	3	198915	26064	665	838	1503	910		936	4853
6K	1989	4	198916	24321	498	1046	1545	680		462	2687
6K	1990	1	199013	14981	874	3933	4807	4869		1034	15516
6L	1989	2	198914	30973	632	1946	2577	1035		578	6768
6L	1989	3	198915	36417	706	1675	2381	1076		1123	6961
6L	1989	4	198916	22818	419	522	941	829		439	2210
6L	1990	1	199013	20126	790	2313	3103	2702		1130	10039

BN	FY	QTR	FYQTR	NDEPFN	NDEPLDS	NCOIFN	NCOILD	DIRMAIL
1A	1989	2	198914	11	369	1	15	12325
1A	1989	3	198915	6	174	0	0	31983
1A	1989	4	198916	20	427	1	89	17727
1A	1990	1	199013	30	745	4	178	.
1B	1989	2	198914	24	462	9	661	25711
1B	1989	3	198915	23	1110	8	734	98714
1B	1989	4	198916	28	476	0	0	39241
1B	1990	1	199013	12	362	14	1034	.
1C	1989	2	198914	8	329	4	289	22574
1C	1989	3	198915	4	505	2	600	162333
1C	1989	4	198916	2	101	2	136	20987
1C	1990	1	199013	5	220	4	170	.
1D	1989	2	198914	33	704	5	124	14288
1D	1989	3	198915	24	537	5	90	71069
1D	1989	4	198916	28	476	0	0	16472
1D	1990	1	199013	32	747	8	333	.
1E	1989	2	198914	14	565	9	180	14192
1E	1989	3	198915	14	682	7	446	45141
1E	1989	4	198916	7	256	1	45	21600
1E	1990	1	199013	11	313	10	525	.
1F	1989	2	198914	18	558	4	69	12007
1F	1989	3	198915	21	756	6	770	53417
1F	1989	4	198916	16	621	1	31	17429
1F	1990	1	199013	9	395	11	386	.
1G	1989	2	198914	18	541	5	232	32729
1G	1989	3	198915	5	297	2	64	88821
1G	1989	4	198916	11	305	1	23	49711
1G	1990	1	199013	9	378	4	142	.
1H	1989	2	198914	13	303	3	110	32322
1H	1989	3	198915	15	507	6	568	98334
1H	1989	4	198916	6	281	0	0	42775
1H	1990	1	199013	12	371	4	265	.
1K	1989	2	198914	26	771	4	124	15197
1K	1989	3	198915	21	687	7	423	66337
1K	1989	4	198916	16	591	2	158	22278
1K	1990	1	199013	30	688	11	585	.
1L	1989	2	198914	19	511	8	199	21225
1L	1989	3	198915	25	922	9	321	83249
1L	1989	4	198916	16	493	5	319	31269
1L	1990	1	199013	24	838	9	480	.
1N	1989	2	198914	39	871	4	67	26832
1N	1989	3	198915	41	1108	6	87	68468
1N	1989	4	198916	34	861	1	5	36006
1N	1990	1	199013	36	808	15	498	.
3A	1989	2	198914	22	702	11	916	16940
3A	1989	3	198915	21	697	6	549	55472
3A	1989	4	198916	16	718	0	0	26194
3A	1990	1	199013	15	618	8	801	.
3B	1989	2	198914	14	519	12	451	13681
3B	1989	3	198915	13	581	11	457	62143
3B	1989	4	198916	14	498	13	649	19840
3B	1990	1	199013	10	293	15	822	.
3C	1989	2	198914	19	645	5	117	15490

BN	FY	QTR	FYQTR	NDEPFN	NDEPLDS	NCOIFN	NCOILD	DIRMAIL
3C	1989	3	198915	5	192	4	76	57565
3C	1989	4	198916	22	[illegible]	4	162	23064
3C	1990	1	199013	6	362	7	304	.
3D	1989	2	198914	10	327	4	433	23583
3D	1989	3	198915	12	502	4	114	127215
3D	1989	4	198916	5	260	12	1071	39506
3D	1990	1	199013	12	456	7	638	.
3E	1989	2	198914	21	901	22	2095	28858
3E	1989	3	198915	22	843	4	387	161556
3E	1989	4	198916	12	490	5	488	43632
3E	1990	1	199013	16	602	11	599	.
3F	1989	2	198914	26	658	7	226	16086
3F	1989	3	198915	33	852	10	293	80655
3F	1989	4	198916	19	450	8	563	24835
3F	1990	1	199013	28	680	10	418	.
3G	1989	2	198914	17	869	6	237	32876
3G	1989	3	198915	16	833	9	853	187617
3G	1989	4	198916	15	562	3	269	46768
3G	1990	1	199013	15	859	12	698	.
3H	1989	2	198914	9	301	9	367	18988
3H	1989	3	198915	13	603	3	123	72489
3H	1989	4	198916	10	459	11	561	30237
3H	1990	1	199013	23	902	21	819	.
3I	1989	2	198914	32	1252	12	319	24030
3I	1989	3	198915	24	663	3	170	120509
3I	1989	4	198916	22	622	7	691	40910
3I	1990	1	199013	19	619	13	766	.
3J	1989	2	198914	24	426	12	672	10174
3J	1989	3	198915	16	597	15	1012	39568
3J	1989	4	198916	19	756	20	1464	14683
3J	1990	1	199013	20	785	20	1320	.
3K	1989	2	198914	21	596	10	827	11962
3K	1989	3	198915	7	303	5	470	41164
3K	1989	4	198916	12	392	4	315	18732
3K	1990	1	199013	16	515	2	173	.
5A	1989	2	198914	30	1362	12	701	28716
5A	1989	3	198915	29	1163	4	136	205513
5A	1989	4	198916	9	367	2	26	48960
5A	1990	1	199013	17	755	13	456	.
5B	1989	2	198914	42	1289	20	1417	15726
5B	1989	3	198915	22	1009	7	429	88395
5B	1989	4	198916	11	350	1	36	19390
5B	1990	1	199013	16	526	4	135	.
5C	1989	2	198914	30	629	3	146	27819
5C	1989	3	198915	18	694	10	208	160615
5C	1989	4	198916	43	1752	12	775	30302
5C	1990	1	199013	23	575	14	775	.
5D	1989	2	198914	22	658	18	1183	16688
5D	1989	3	198915	26	944	6	215	88978
5D	1989	4	198916	20	584	4	264	19390
5D	1990	1	199013	26	643	8	216	.
5E	1989	2	198914	22	796	5	556	19423
5E	1989	3	198915	25	794	8	386	101154

BN	FY	QTR	FYQTR	NDEPFN	NDEPLDS	NCOIFN	NCOILD	DIRMAIL
5E	1989	4	198916	8	230	4	172	28333
5E	1990	1	199013	11	367	4	174	.
5F	1989	2	198914	18	504	9	2091	24738
5F	1989	3	198915	20	658	4	903	151832
5F	1989	4	198916	19	662	3	462	39499
5F	1990	1	199013	20	680	17	629	.
5H	1989	2	198914	28	924	10	304	13421
5H	1989	3	198915	13	757	6	234	41978
5H	1989	4	198916	7	194	6	307	18852
5H	1990	1	199013	9	486	5	262	.
5I	1989	2	198914	13	534	11	350	24859
5I	1989	3	198915	11	475	1	37	151832
5I	1989	4	198916	28	931	11	367	39499
5I	1990	1	199013	43	1509	17	698	.
5J	1989	2	198914	22	641	10	395	28720
5J	1989	3	198915	34	859	6	290	145936
5J	1989	4	198916	12	661	61	5500	31826
5J	1990	1	199013	19	637	11	536	.
5K	1989	2	198914	19	522	4	267	29589
5K	1989	3	198915	26	608	7	247	167815
5K	1989	4	198916	26	783	6	275	41146
5K	1990	1	199013	17	587	10	368	.
5L	1989	2	198914	39	818	7	301	20183
5L	1989	3	198915	32	1095	4	84	79592
5L	1989	4	198916	26	743	14	1233	30343
5L	1990	1	199013	[illegible]	818	9	829	.
5M	1989	2	198914	12	414	5	210	21229
5M	1989	3	198915	26	693	5	122	116528
5M	1989	4	198916	10	273	1	16	34119
5M	1990	1	199013	17	535	5	94	.
4A	1989	2	198914	15	635	3	99	12746
4A	1989	3	198915	33	755	6	645	67311
4A	1989	4	198916	13	517	9	742	22167
4A	1990	1	199013	28	919	19	985	.
4C	1989	2	198914	39	1197	22	923	38820
4C	1989	3	198915	37	1095	12	820	249061
4C	1989	4	198916	27	852	6	537	22167
4C	1990	1	199013	22	701	27	1967	.
4D	1989	2	198914	24	749	5	90	26585
4D	1989	3	198915	28	806	5	72	113313
4D	1989	4	198916	32	703	3	29	22958
4D	1990	1	199013	40	1007	8	330	.
4E	1989	2	198914	11	332	3	110	33446
4E	1989	3	198915	20	312	2	98	207855
4E	1989	4	198916	16	520	23	1376	46805
4E	1990	1	199013	39	987	10	396	.
4F	1989	2	198914	20	694	7	329	23339
4F	1989	3	198915	41	714	6	184	133496
4F	1989	4	198916	12	482	2	322	39223
4F	1990	1	199013	21	763	8	563	.
4G	1989	2	198914	8	398	7	220	28267
4G	1989	3	198915	22	400	7	383	127842
4G	1989	4	198916	19	521	10	133	34490

BN	FY	QTR	FYQTR	NDEPFN	NDEPLDS	NCOIFN	NCOILD	DIRMAIL
4G	1990	1	199013	18	815	14	587	.
4H	1989	2	198914	40	1404	20	741	14892
4H	1989	3	198915	59	1268	8	265	73719
4H	1989	4	198916	15	408	6	112	25418
4H	1990	1	199013	23	756	10	603	.
4I	1989	2	198914	24	697	5	117	14632
4I	1989	3	198915	43	946	7	435	103783
4I	1989	4	198916	6	436	13	560	25872
4I	1990	1	199013	12	483	6	284	.
4J	1989	2	198914	24	793	11	447	14837
4J	1989	3	198915	29	616	1	17	55450
4J	1989	4	198916	22	714	5	412	22730
4J	1990	1	199013	17	574	7	374	.
4K	1989	2	198914	25	748	17	1030	24747
4K	1989	3	198915	45	809	12	276	140465
4K	1989	4	198916	16	414	2	65	35590
4K	1990	1	199013	26	586	4	259	.
4N	1989	2	198914	24	654	8	367	28526
4N	1989	3	198915	34	427	2	95	165402
4N	1989	4	198916	37	788	2	15	42467
4N	1990	1	199013	38	943	8	229	.
6A	1989	2	198914	13	549	11	548	15212
6A	1989	3	198915	23	330	10	406	65875
6A	1989	4	198916	18	675	6	218	20297
6A	1990	1	199013	9	333	11	436	.
6F	1989	2	198914	4	230	19	340	4410
6F	1989	3	198915	71	2645	28	2138	14673
6F	1989	4	198916	15	898	4	183	5358
6F	1990	1	199013	13	851	13	736	.
6G	1989	2	198914	14	540	9	564	18960
6G	1989	3	198915	25	438	9	671	60782
6G	1989	4	198916	5	267	6	391	22815
6G	1990	1	199013	6	320	11	682	.
6H	1989	2	198914	24	846	16	643	13587
6H	1989	3	198915	48	1484	15	814	83216
6H	1989	4	198916	17	481	1	93	24990
6H	1990	1	199013	8	415	7	251	.
6I	1989	2	198914	20	586	10	323	13472
6I	1989	3	198915	27	1244	9	495	61658
6I	1989	4	198916	23	1097	0	0	18897
6I	1990	1	199013	14	593	4	84	.
6J	1989	2	198914	7	426	5	831	19574
6J	1989	3	198915	20	647	12	449	76570
6J	1989	4	198916	7	424	3	234	30799
6J	1990	1	199013	5	177	4	101	.
6K	1989	2	198914	11	904	19	1028	25032
6K	1989	3	198915	42	1300	23	1990	83228
6K	1989	4	198916	21	1090	5	446	28036
6K	1990	1	199013	7	324	13	903	.
6L	1989	2	198914	21	887	17	829	11113
6L	1989	3	198915	51	1598	7	326	81700
6L	1989	4	198916	21	1090	5	446	17318
6L	1990	1	199013	9	378	7	653	.

OVARIABLE	MEAN	STD DEV	MINIMUM	MAXIMUM	VALID N	LABEL
BDE	3.698	1.682	1	6	212	
BN	THIS IS A STRING (ALPHANUMERIC) VARIABLE.					
FY	1989.250	.434	1989	1990	212	
QTR	2.500	1.121	1	4	212	
FYQTR	198939.500	42.542	198914	199013	212	
RTYPE	THIS IS A STRING (ALPHANUMERIC) VARIABLE.					
GMA	143.698	46.006	54	330	212	
SMA	77.061	36.414	-6	199	212	
NMA	45.981	24.004	7	126	212	
GMB	84.075	42.727	19	235	212	
SMB	46.481	24.514	-5	125	212	
NMB	7.873	14.389	0	66	212	
GM4	25.075	20.158	-2	104	212	
SM4	.014	.118	0	1	212	
NM4	.000	.000	0	0	212	
GFA	38.057	15.127	9	97	212	
SFA	11.024	8.356	-11	36	212	
NFA	.151	.628	-1	5	212	
GFB	28.307	18.327	2	95	212	
SFB	2.575	5.703	-5	36	212	
NFB	.005	.069	0	1	212	
GF4	.245	.911	0	6	212	
SF4	.000	.000	0	0	212	
NF4	.000	.000	0	0	212	
PSB	13.887	7.110	2	36	212	
PSA	28.528	11.220	8	67	212	
QMA	808.019	546.370	68	2282	212	
HSMMA	20861.208	6560.223	9071	35501	212	
HSMMB	12618.623	3754.586	6702	26947	212	
HSMM4	14506.472	5520.911	5825	34869	212	
HSMFA	20738.547	6353.222	9505	35165	212	
HSMFB	12646.774	3813.101	6608	27178	212	
HSMF4	14475.340	5721.994	5612	35199	212	
MHSSR	28322.642	8438.192	15864	55535	212	
FHSSR	28304.509	8427.757	15362	55709	212	
ARRCTR	102.934	25.297	54	173	212	
DODRCTR	137.090	36.847	55	261	212	
UNEM	53.415	13.370	34	105	212	
RCTREX	689.259	54.014	532	838	212	
PROP	155.189	41.641	89	251	212	
LMPS	28948.198	14595.893	7267	95434	212	
CATVGRP	892.123	578.097	42	3026	212	
NETVGRP	2279.392	1636.151	103	8374	212	
BRDGRP	3171.495	2097.950	155	10038	212	
MAGGRP	2282.684	2781.074	126	19024	212	
RADGRP	2761.420	1926.397	132	10793	212	
TOTGRP	10858.642	7584.453	583	38896	212	
NDEPFN	20.585	10.907	2	71	212	

ONUMBER OF VALID OBSERVATIONS (LISTWISE) = 159.00

OVARIABLE	MEAN	STD DEV	MINIMUM	MAXIMUM	VALID N	LABEL
NDEPLDS	662.736	316.675	101	2645	212	
NCOIFN	8.208	6.557	0	61	212	
NCOILD	467.179	523.023	0	5500	212	
DIRMAIL	50117.711	4684[illegible].721	4410	249061	159	
GSMA	220.759	62.482	89	403	212	
GSMB	130.557	54.381	39	277	212	
GSFA	49.080	17.899	17	103	212	
CDODRCTR	384.910	36.847	261.00	467.00	212	

111-Jun-90 DATA SUMMARY: ADEFF DATABASE, QTRS 2,3,4 FY89, QTR1 FY90

07:43:50 OVERALL DATA DESCRIPTION

2. By Quarter

111-Jun-90 DATA SUMMARY: ADEFF DATABASE, QTRS 2,3,4 FY89, QTR1 FY90
07:43:32 QUARTER 2 1989
ONUMBER OF VALID OBSERVATIONS (LISTWISE) = 53.00

OVARIABLE	MEAN	VARIANCE	RANGE	MINIMUM	MAXIMUM	SUM
BDE	3.698	2.869	5.000	1	6	196.000
BN	THIS IS A STRING (ALPHANUMERIC) VARIABLE.					
FY	1989.000	.000	.000	1989	1989	105417.000
QTR	2.000	.000	.000	2	2	106.000
FYQTR	198914.000	.000	.000	198914	198914	10542442.000
RTYPE	THIS IS A STRING (ALPHANUMERIC) VARIABLE.					
GMA	133.981	1548.019	218.000	54	272	7101.000
SMA	97.547	1028.714	141.000	35	176	5170.000
NMA	51.302	592.369	106.000	16	122	2719.000
GMB	72.094	1168.664	136.000	19	155	3821.000
SMB	57.377	666.432	106.000	19	125	3041.000
NMB	.057	.093	2.000	0	2	3.000
GM4	47.226	591.563	94.000	10	104	2503.000
SM4	.019	.019	1.000	0	1	1.000
NM4	.000	.000	.000	0	0	.000
GFA	33.472	176.985	52.000	9	61	1774.000
SFA	15.925	50.263	30.000	3	33	844.000
NFA	.075	.110	2.000	0	2	4.000
GFB	24.113	225.795	62.000	2	64	1278.000
SFB	-.075	.148	3.000	-2	1	-4.000
NFB	.000	.000	.000	0	0	.000
GF4	.660	2.382	6.000	0	6	35.000
SF4	.000	.000	.000	0	0	.000
NF4	.000	.000	.000	0	0	.000
PSB	10.226	24.640	21.000	2	23	542.000
PSA	30.283	152.207	48.000	12	60	1605.000
QMA	817.453	303446.253	2214.000	68	2282	43325.000
HSMMA	20861.208	43657250.168	26430.000	9071	35501	1105644.000
HSMMB	12618.623	14300235.663	20245.000	6702	26947	668787.000
HSMM4	14506.472	30920078.369	29044.000	5825	34869	768843.000
HSMFA	20738.547	40945589.099	25660.000	9505	35165	1099143.000
HSMFB	12646.774	14749449.332	20570.000	6608	27178	670279.000
HSMF4	14475.340	33213447.075	29587.000	5612	35199	767193.000
MHSSR	28322.642	72230046.696	39671.000	15864	55535	1501100.000
FHSSR	28304.509	72051514.793	40347.000	15362	55709	1500139.000
ARRCTR	102.849	628.054	110.000	58	168	5451.000
DODRCTR	133.113	1248.372	169.000	57	226	7055.000
UNEM	57.717	225.515	69.000	36	105	3059.000
RCTREX	694.849	3224.515	202.000	591	793	36827.000
PROP	155.189	1759.002	162.000	89	251	8225.000
LMPS	31332.566	126194440.98	44553.000	9003	53556	1660626.000
CATVGRP	902.755	278458.458	2077.000	52	2129	47846.000
NETVGRP	3110.453	3448215.406	8073.000	301	8374	164854.000
BRDGRP	4013.302	5232617.792	9558.000	352	9910	212705.000
MAGGRP	1141.774	333337.602	2978.000	168	3146	60514.000
RADGRP	3126.453	3307057.483	7528.000	325	7853	165702.000
TOTGRP	12294.868	41255146.117	25880.000	1365	27245	651628.000
NDEPFN	20.811	82.348	38.000	4	42	1103.000

ONUMBER OF VALID OBSERVATIONS (LISTWISE) = 53.00

OVARIABLE	MEAN	VARIANCE	RANGE	MINIMUM	MAXIMUM	SUM
NDEPLDS	670.566	73791.443	1174.000	230	1404	35540.000
NCOIFN	9.321	30.799	21.000	1	22	494.000
NCOILD	494.906	205589.087	2080.000	15	2095	26230.000
DIRMAIL	20667.509	55354477.332	34410.000	4410	38820	1095378.000
GSMA	231.528	3697.331	271.000	114	385	12271.000
GSMB	129.472	2782.023	207.000	44	251	6862.000
GSFA	49.396	273.705	73.000	17	90	2618.000
CDODRCTR	388.887	1248.372	169.000	296.00	465.00	20611.000

111-Jun-90 DATA SUMMARY: ADEFF DATABASE, QTRS 2,3,4 FY89, QTR1 FY90
07:43:33 QUARTER 3 1989
ONUMBER OF VALID OBSERVATIONS (LISTWISE) = 53.00

OVARIABLE	MEAN	VARIANCE	RANGE	MINIMUM	MAXIMUM	SUM
BDE	3.698	2.869	5.000	1	6	196.000
BN	THIS IS A STRING (ALPHANUMERIC) VARIABLE.					
FY	1989.000	000	.000	1989	1989	105417.000
QTR	3.000	.000	.000	3	3	159.000
FYQTR	198915.000	.000	.000	198915	198915	10542495.000
RTYPE	THIS IS A STRING (ALPHANUMERIC) VARIABLE.					
GMA	122.434	1519.058	166.000	54	220	6489.000
SMA	63.755	436.996	85.000	34	119	3379.000
NMA	58.698	691.830	101.000	25	126	3111.000
GMB	71.811	1179.925	135.000	22	157	3806.000
SMB	38.264	363.621	75.000	9	84	2028.000
NMB	28.849	232.477	64.000	2	66	1529.000
GM4	21.642	167.081	42.000	4	46	1147.000
SM4	.019	.019	1.000	0	1	1.000
NM4	.000	.000	.000	0	0	.000
GFA	35.849	177.708	60.000	12	72	1900.000
SFA	10.774	28.871	31.000	-3	28	571.000
NFA	.491	1.255	5.000	0	5	26.000
GFB	28.019	325.211	76.000	3	79	1485.000
SFB	10.962	32.152	34.000	2	36	581.000
NFB	.019	.019	1.000	0	1	1.000
GF4	.321	.684	5.000	0	5	17.000
SF4	.000	.000	.000	0	0	.000
NF4	.000	.000	.000	0	0	.000
PSB	15.396	50.167	31.000	5	36	816.000
PSA	26.226	99.679	49.000	8	57	1390.000
QMA	817.453	303446.253	2214.000	68	2282	43325.000
HSMMA	20861.208	43657250.168	26430.000	9071	35501	1105644.000
HSMMB	12618.623	14300235.663	20245.000	6702	26947	668787.000
HSMM4	14506.472	30920078.369	29044.000	5825	34869	768843.000
HSMFA	20738.547	40945589.099	25660.000	9505	35165	1099143.000
HSMFB	12646.774	14749449.332	20570.000	6608	27178	670279.000
HSMF4	14475.340	33213447.075	29587.000	5612	35199	767193.000
MHSSR	28322.642	72230046.696	39671.000	15864	55535	1501100.000
FHSSR	28304.509	72051514.793	40347.000	15362	55709	1500139.000
ARRCTR	102.377	670.778	108.000	54	162	5426.000
DODRCTR	134.491	1223.524	166.000	57	223	7128.000
UNEM	53.189	178.656	58.000	34	92	2819.000
RCTREX	690.283	2870.399	246.000	560	806	36585.000
PROP	155.189	1759.002	162.000	89	251	8225.000
LMPS	28034.811	84985086.502	39740.000	11441	51181	1485845.000
CATVGRP	928.642	276309.196	2292.000	62	2354	49218.000
NETVGRP	1552.377	809586.509	4395.000	191	4586	82276.000
BRDGRP	2481.057	1849109.631	6687.000	253	6940	131496.000
MAGGRP	1143.226	309038.294	2835.000	168	3003	60591.000
RADGRP	3541.226	5161153.679	10527.000	266	10793	187685.000
TOTGRP	9646.679	23184266.953	21288.000	1260	22548	511274.000
NDEPFN	25.679	188.914	67.000	4	71	1361.000

111-Jun-90 DATA SUMMARY: ADEFF DATABASE, QTRS 2,3,4 FY89, QTR1 FY90
07:43:33 QUARTER 3 1989

0NUMBER OF VALID OBSERVATIONS (LISTWISE) = 53.00

0VARIABLE	MEAN	VARIANCE	RANGE	MINIMUM	MAXIMUM	SUM
NDEPLDS	783.660	167093.306	2471.000	174	2645	41534.000
NCOIFN	7.189	24.848	28.000	0	28	381.000
NCOIFD	424.094	173728.972	2138.000	0	2138	22477.000
DIRMAIL	100743.132	2554[illegible]6181.7	234388.000	14673	249061	5339386.000
GSMA	186.189	2592.694	227.000	89	316	9868.000
GSMB	110.075	2359.879	181.000	39	220	5834.000
GSFA	46.623	274.970	71.000	21	92	2471.000
CDODRCTR	387.509	1223.524	166.000	299.00	465.00	20538.000

111-Jun-90 DATA SUMMARY: ADEFF DATABASE, QTRS 2,3,4 FY89, QTR1 FY90
07:43:33 QUARTER 3 1989

111-Jun-90 DATA SUMMARY: ADEFF DATABASE, QTRS 2,3,4 FY89, QTR1 FY90
07:43:33 QUARTER 4 1989

ONUMBER OF VALID OBSERVATIONS (LISTWISE) = 53.00

OVARIABLE	MEAN	VARIANCE	RANGE	MINIMUM	MAXIMUM	SUM
BDE	3.698	2.869	5.000	1	6	196.000
BN	THIS IS A STRING (ALPHANUMERIC) VARIABLE.					
FY	1989.000	.000	.000	1989	1989	105417.000
QTR	4.000	.000	.000	4	4	212.000
FYQTR	198916.000	.000	.000	198916	198916	10542548.000
RTYPE	THIS IS A STRING (ALPHANUMERIC) VARIABLE.					
GMA	167.509	2463.755	243.000	87	330	8878.000
SMA	47.642	800.042	125.000	-6	119	2525.000
NMA	45.887	348.333	92.000	21	113	2432.000
GMB	110.491	2754.562	202.000	33	235	5856.000
SMB	30.642	207.504	73.000	-5	68	1624.000
NMB	2.132	4.655	8.000	0	8	113.000
GM4	15.811	102.425	48.000	-2	46	838.000
SM4	.019	.019	1.000	0	1	1.000
NM4	.000	.000	.000	0	0	.000
GFA	44.472	283.485	80.000	17	97	2357.000
SFA	2.019	12.019	20.000	-11	9	107.000
NFA	.038	.075	2.000	-1	1	2.000
GFB	37.113	493.564	91.000	4	95	1967.000
SFB	-.434	3.635	10.000	-5	5	-23.000
NFB	.000	.000	.000	0	0	.000
GF4	.000	.000	.000	0	0	.000
SF4	.000	.000	.000	0	0	.000
NF4	.000	.000	.000	0	0	.000
PSB	14.981	58.019	29.000	3	32	794.000
PSA	29.887	139.833	54.000	13	67	1584.000
QMA	798.585	302023.901	2214.000	68	2282	42325.000
HSMMA	20861.208	43657250.168	26430.000	9071	35501	1105644.000
HSMMB	12618.623	14300235.663	20245.000	6702	26947	668787.000
HSMM4	14506.472	30920078.369	29044.000	5825	34869	768843.000
HSMFA	20738.547	40945589.099	25660.000	9505	35165	1099143.000
HSMFB	12646.774	14749449.332	20570.000	6608	27178	670279.000
HSMF4	14475.340	33213447.075	29587.000	5612	35199	767193.000
MHSSR	28322.642	72230046.696	39671.000	15864	55535	1501100.000
FHSSR	28304.509	72051514.793	40347.000	15362	55709	1500139.000
ARRCTR	101.717	639.438	113.000	56	169	5391.000
DODRCTR	140.415	1499.055	206.000	55	261	7442.000
UNEM	51.358	147.542	50.000	34	84	2722.000
RCTREX	688.491	2937.601	250.000	532	782	36490.000
PROP	155.189	1759.002	162.000	89	251	8225.000
LMPS	33664.113	540893059.83	88167.000	7267	95434	1784198.000
CATVGRP	528.509	86845.216	1236.000	42	1278	28011.000
NETVGRP	1388.698	1195284.407	4891.000	103	4994	73601.000
BRDGRP	1917.170	1705719.144	5726.000	155	5881	101610.000
MAGGRP	885.170	200219.874	2262.000	126	2388	46914.000
RADGRP	1332.755	735371.727	4050.000	132	4182	70636.000
TOTGRP	4135.283	4797974.091	8752.000	583	9335	219170.000
NDEPFN	17.189	75.079	41.000	2	43	911.000

111-Jun-90 DATA SUMMARY: ADEFF DATABASE, QTRS 2,3,4 FY89, QTR1 FY90
07:43:33 QUARTER 4 1989

ONUMBER OF VALID OBSERVATIONS (LISTWISE) = 53.00

OVARIABLE	MEAN	VARIANCE	RANGE	MINIMUM	MAXIMUM	SUM
NDEPLDS	581.642	81719.234	1651.000	101	1752	30827.000
NCOIFN	6.358	83.734	61.000	0	61	337.000
NCOILD	429.925	628029.340	5500.000	0	5500	22786.000
DIRMAIL	28942.491	105581297.83	44353.000	5358	49711	1533952.000
GSMA	215.151	3222.554	298.000	94	392	11403.000
GSMB	141.132	3296.001	231.000	46	277	7480.000
GSFA	46.491	305.716	84.000	17	101	2464.000
CDODRCTR	381.585	1499.055	206.000	261.00	467.00	20224.000

ONUMBER OF VALID OBSERVATIONS (LISTWISE) = .00

OVARIABLE	MEAN	VARIANCE	RANGE	MINIMUM	MAXIMUM	SUM
BDE	3.698	2.469	5.000	1	6	196.000
BN	THIS IS A STRING (ALPHANUMERIC) VARIABLE.					
FY	1990.000	.000	.000	1990	1990	105470.000
QTR	1.000	.000	.000	1	1	53.000
FYQTR	199013.000	.000	.000	199013	199013	10547689.000
RTYPE	THIS IS A STRING (ALPHANUMERIC) VARIABLE.					
GMA	150.868	1870.271	193.000	78	271	7996.000
SMA	99.302	1119.984	162.000	37	199	5263.000
NMA	28.038	183.537	59.000	7	66	1486.000
GMB	81.906	1289.010	135.000	23	158	4341.000
SMB	59.642	578.811	112.000	3	115	3161.000
NMB	.453	2.406	8.000	0	8	24.000
GM4	15.623	97.047	36.000	3	39	828.000
SM4	.000	.000	.000	0	0	.000
NM4	.000	.000	.000	0	0	.000
GFA	38.434	221.866	59.000	13	72	2037.000
SFA	15.377	65.624	36.000	0	36	815.000
NFA	.000	.000	.000	0	0	.000
GFB	23.981	202.173	61.000	3	64	1271.000
SFB	-.151	.400	4.000	-3	1	-8.000
NFB	.000	.000	.000	0	0	.000
GF4	.000	.000	.000	0	0	.000
SF4	.000	.000	.000	0	0	.000
NF4	.000	.000	.000	0	0	.000
PSB	14.943	53.978	32.000	2	34	792.000
PSA	27.717	107.976	43.000	10	53	1469.000
QMA	798.585	302023.901	2214.000	68	2282	42325.000
HSMMA	20861.208	43657250.168	26430.000	9071	35501	1105644.000
HSMMB	12618.623	14300235.663	20245.000	6702	26947	668787.000
HSMM4	14506.472	30920078.369	29044.000	5825	34869	768843.000
HSMFA	20738.547	40945589.099	25660.000	9505	35165	1099143.000
HSMFB	12646.774	14749449.332	20570.000	6608	27178	670279.000
HSMF4	14475.340	33213447.075	29587.000	5612	35199	767193.000
MHSSR	28322.642	72230046.696	39671.000	15864	55535	1501100.000
FHSSR	28304.509	72051514.793	40347.000	15362	55709	1500139.000
ARRCTR	104.792	653.091	113.000	60	173	5554.000
DODRCTR	140.340	1493.113	206.000	55	261	7438.000
UNEM	51.396	146.282	50.000	34	84	2724.000
RCTREX	683.415	2737.555	290.000	548	838	36221.000
PROP	155.189	1759.002	162.000	89	251	8225.000
LMPS	22761.302	44052315.638	29720.000	11758	41478	1206349.000
CATVGRP	1208.585	476144.094	2952.000	74	3026	64055.000
NETVGRP	3066.038	2727347.729	6595.000	417	7012	162500.000
BRDGRP	4274.453	5020417.406	9547.000	491	10038	226546.000
MAGGRP	5960.566	12113526.789	18256.000	768	19024	315910.000
RADGRP	3045.245	2936422.612	6986.000	447	7433	161398.000
TOTGRP	17357.736	71454151.506	36466.000	2430	38896	919960.000
NDEPFN	18.660	94.344	38.000	5	43	989.000

ONUMBER OF VALID OBSERVATIONS (LISTWISE) = .00

OVARIABLE	MEAN	VARIANCE	RANGE	MINIMUM	MAXIMUM	SUM
NDEPLDS	615.075	6032[illegible].956	1332.000	177	1509	32599.000
NCOIFN	9.962	26.114	25.000	2	27	528.000
NCOILD	519.792	117058.706	1883.000	84	1967	27549.000
DIRMAIL	VARIABLE IS MISSING FOR EVERY CASE.					
GSMA	250.170	4078.528	257.000	146	403	13259.000
GSMB	141.547	2895.983	212.000	56	268	7502.000
GSFA	53.811	409.733	84.000	19	103	2852.000
CDODRCTR	381.660	1493.113	206.000	261.00	467.00	20228.000

111-Jun-90 DATA SUMMARY: ADEFF DATABASE, QTRS 2,3,4 FY89, QTR1 FY90
07:43:34 QUARTER 1 1990

C. System User Manual

The ADEFF system described in this report has been developed for the IBM family of personal computers and their compatibles. It requires 640K RAM and operates best on a 386 machine. At least 530K RAM must be available to invoke the system; it is recommended that all TSRs be cleared before using this software, which was developed in the C programming language and in FORTRAN.

1. Files Required

The following files are required for proper utilization of the ADEFF system:

File Name	Purpose
DEA0.EXE	Data construction and spreadsheet development
DEAEST.EXE	DEA solution software
RANA.EXE	Goal program solution and sensitivity analysis software
ADEFF.DAT	USAREC-supplied data base
SPEC.@@@	Specification file

In addition, the following files are provided for the previously developed DEA-based Mission Adjustment Model:

File Name	Purpose
DBMA.BAT	File definition and startup
DMS123.EXE	DEA software for models 1-3
DMS4.EXE	DEA software for model 4
MISS1.EXE	User interface and transformation, model 1
MISS2.EXE	User interface and transformation, model 2
MISS3.EXE	User interface and transformation, model 3
MISS4.EXE	User interface and transformation, model 4
RAW2.DAT	The EPM data base
SUMM.EXE	Report generator

The user manual for the DBMA system can be found in Center for Cybernetic Studies Research Report No. 612 [1]. The software is provided in its entirety in an executable format and is copyrighted by the Center for Cybernetic Studies.

2. Starting the System

The system is invoked by typing "DEA0" at the prompt of the directory that the software is installed. Of course, this exec file can be renamed to any suitable name for ease of use and memory. Upon invoking the software, the user will be prompted sequentially for the following information:

"Enter Analysis Year"

"Enter Analysis Quarter (1,2,3,4)"

At the year prompt, enter the year as a four digit number, e.g., 1990.

Upon receiving the information from the user, the software retrieves the relevant subset of the data from the data base and prepares it for analysis in the DEA and goal program modules. Additionally, the data are presented to the user in a spreadsheet format, with DMU number, battalion code, and time period provided on the left of the spreadsheet, and inputs followed by the output with labels in the body of the spreadsheet. A menu bar is provided across the top of the spreadsheet by pressing the "Escape" key at any time. The following menu choices are offered: File, Edit, Run, View and Quit. A brief one-line description of each of the choices is provided in the lower right-hand corner of the monitor screen. A pull-down menu for each of these choices is available by using the cursor keys to highlight the particular choice and then pressing "Enter," or by simply typing the capitalized letter of the choice. In some cases control or alternate key methods are also provided. Again, a short phrase description of each pull-down menu choice is provided (as the choice is highlighted) in the lower right-hand corner of the monitor screen. Each pull-down menu will now be briefly discussed.

3. File Commands

Upon pressing "Enter" on the highlighted "File" menu bar item, the following choices are offered in a pull-down menu:

Title
New
Load
Save
Save As
Read
DOS

The choices are self-explanatory. Caution should be used when using the "DOS" choice--this command sends the user to the DOS environment while maintaining the entire ADEFF system in memory. It is recommended that while in the DOS choice, other memory resident programs not

be used because a system lockup may occur. This choice is mainly provided to allow for use of simple DOS commands, suc... .s DIR, CHKDSK, etc. To return to the ADEFF system, type "EXIT" and press "RETURN."

4. Edit Commands

A complete editing function is offered in this menu choice. Again, the choices are self-explanatory. Deleting rows corresponds to deleting DMUs or battalions. Deleting columns corresponds to deleting inputs. Caution should be used in changing the data base and performing a new DEA analysis as this results in a structure change that has not been explored pursuant to this research. The statistical estimation theory relating to DEA is still under development. Small changes in the data should be acceptable, but remember that the contracts (output) recorded for any given time period are the actual production as reported by USAREC. DEA for the individual brigades should still satisfy certain statistical limitations on the number of DMUs, inputs and outputs required for stability of the estimates. Ridiculous changes, however, such as the deletion of known important inputs while holding the output level constant is a misuse of the DEA methodology and interpretation of results from such analysis may be misleading. Changes in the input and/or output levels require further estimation and should only be performed in the properly aggregated analysis module that follows.

This file-editing portion is mainly supplied for such data base management as preparing the ADEFF data base for use in other applications--e.g., data analysis and graphics packages.

5. Run Commands

The commands provided in this pull-down menu allow for invoking the ADEFF model or the earlier developed DBMA model.

The DBMA model was provided as an additional feature for this effort. No changes in the code have been made; since it was designed for mainframe use, this code is somewhat slower in processing than the computationally efficient ADEFF system. Selection of this mode will place the user in the DBMA user interface; see CCS Report 612 [1] for instructions on its use.

Upon selection of the ADEFF model, each DMU number will appear on the screen as the DEA calculation is completed. After the prompt "Analysis Complete" appears, pressing any key returns the user to the menu for other choices.

6. View Commands

The View Commands pull-down menu provides the gateway for the series of reports and graphics that are supplied with the system of models. Additionally, this menu provides the goal programming-based sensitivity analysis module for macro decision support.

The first three choices, "Summary," "Report," and "F-Table," provide results of the high-resolution, battalion DEA analysis. Sample copies of these choices are found in Part 8 below. Each choice again is selected by highlighting or by entering the capital letter of the choice.

"Summary" includes the Executive Summary Report, a one-page screen that gives an overview of the entire analysis. "Report" provides the detailed, battalion-by-battalion analysis, where efficiency scores, comparison sets, and potential values if efficient are presented. Here, trade-off assessments, as described earlier, can be made.

"F-Table" provides the facet participation table, or the comparison set used to calculate each battalion's efficiency. Lambda values are also provided that may be interpreted as the relative importance each facet member or comparison unit contributed in determining a particular battalion's efficiency score. A higher lambda value may indicate that a particular efficient battalion used as a comparison unit should be examined prior to one with a lesser value, when searching for possible managerial clues to increasing the efficiency of the battalion under observation.

The graphics choice provides a graphical interpretation of the DEA analysis. This module provides a series of two-dimensional graphs depicting each input in the analysis plotted against GSMA contracts, the output. Each efficient battalion, as determined by the DEA, is presented as a flashing battalion code. Inefficient battalions are depicted as red battalion codes, while "potential value if efficient" (the efficiency projection) is presented in white. In the case of overlapping symbols, where two or more battalions are demonstrating similar input-output combinations, each battalion can be displayed sequentially. This allows the user to display each battalion one at a time,

thus removing any masking caused by the overlap. The graphic analysis also allows the user to explore trends between the input-output pairs. In effect, these graphics actually portray the efficiency frontier, two dimensions at a time.

The selection of this menu choice presents another user interface that allows for selection of proposed changes in any of the inputs, one at a time or in any combination. The user is prompted for a factor for each input. As previously mentioned in 4. Edit Commands, this factor should be a reasonable change in the input under consideration. Scroll through the inputs by using the cursor keys. To enter a proposed factor for analysis, type the factor and press "Enter." For example, to assess the impact of a 10 percent reduction in Army recruiters, enter ".9" in the Army recruiter box. Then press "Enter." If you fail to press "Enter" and then move to another input, the factor for the previous input will not be included in the multiplicative modeling estimation phase. Once all input factor changes have been entered, press function key "F8" to invoke the model system. Results will be displayed almost immediately, describing the impact such changes will have on the GSMA output level.

The impact of reducing the output level by a factor on a single input may also be assessed. Simply scroll to the GSMA box in the user interface and enter the proposed factor to be analyzed. Then, to select the input to be analyzed, scroll through the inputs in the analysis user interface and enter "-1," then press "Enter." By then pressing function key "F8," the impact such a change in the output level has on the flagged input will be displayed.

7. Quitting the System

This menu choice offers the means to completely exit the ADEFF system, clearing all TSRs, and returning the user to the DOS environment. Choosing "Yes" requires the user to enter a "Y" or to move the cursor to the "Yes" prompt. This is the only acceptable means to ensure that the TSRs are cleared. At any time, a "CTRL C" can be entered; whether or not the TSRs are cleared depends upon the version of DOS and the actual hardware configuration employed. Choosing "No" returns the user to the ADEFF interface.

8. Reports

(a) Executive Summary Report

```
*************************
* DEA EXECUTIVE SUMMARY *
*************************

ANALYSIS  PERIOD:   QTR 1  FY90

NUMBER OF BNS IN ANALYSIS PERIOD:   53

NUMBER OF EFFICIENT BNS:            25

EFFICIENCY RANGE:                   .1196

EFFICIENCY SD:                      .0403

EFFICIENCY MEDIAN:                  .9402

****************************************************
*                                                  *
* TOTAL GSMA CONTRACTS IF EFFICIENT   :   13453.02 *
*                                                  *
* POTENTIAL IMPROVEMENT IF EFFICIENT  :     194.02 *
*                                                  *
* % CHANGE FROM ACTUAL                :       1.46 *
*                                                  *
* TOTAL NATIONAL GRPS IF EFFICIENT    :  437233.90 *
*                                                  *
* % CHANGE FROM ACTUAL                :     -37.88 *
*                                                  *
* TOTAL LMPS EXPENDITURES IF EFFICIENT: 1116875.86 *
*                                                  *
* % CHANGE FROM ACTUAL                :      -7.42 *
*                                                  *
****************************************************
```

(b) Sample from "Report:"

```
*****************
* SUMMARY TABLE *
*****************

DEA RUN TITLE: Run Name

DEA MODEL: EXTENDED ADDITIVE

DECISION MAKING UNIT:    11     IN..19901

EFFICIENCY:    .908

EFFECTIVE COMPARISON SET:    3G    1H    6F    1D

                                  POTENTIAL
                                  VALUE IF     POTENTIAL
                     ACTUAL       EFFICIENT    IMPROVEMENT
***********        ----------    ----------    ----------
* OUTPUTS *
***********
GSMA                  309.00        309.00            .00

***********
* INPUTS  *
***********
ARMY_RCTR             123.00        123.00            .00
DOD_RCTR              347.00        342.74          -4.26
UNEMPLOY                5.00          5.00            .00
LMPS                29931.00      20652.68       -9278.32
RADIO_GRP            4513.00       1557.24       -2955.76
MAG_GRPS            19024.00       3965.95      -15058.05
CATV_GRPS            2498.00        634.25       -1863.75
NETTV_GRP            4545.00       1153.99       -3391.01
```

(c) Sample from "F-Table:"

NO.	Run Name DMU NAME	EFF. SCORE	FACET	
1	1A..19901	1.0000		
			1A..19901	(1.00)
			1D..19901	(.00)
			1H..19901	(.00)
2	1B..19901	1.0000		
			1B..19901	(1.00)
			3E..19901	(.00)
			6F..19901	(.00)
			3K..19901	(.00)
3	1C..19901	.9377		
			1G..19901	(.19)
			6F..19901	(.15)
			1D..19901	(.32)
			1H..19901	(.33)
4	1D..19901	1.0000		
			1D..19901	(1.00)
			3G..19901	(.00)
			1H..19901	(.00)
5	1E..19901	.9198		
			1G..19901	(.24)
			6F..19901	(.44)
			1D..19901	(.29)
			1H..19901	(.03)
6	1F..19901	.9316		
			1K..19901	(.06)
			1D..19901	(.47)
			5B..19901	(.05)
			1H..19901	(.43)